Telecommunications Services and Regional Development

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Telecommunications Services and Regional Development: The Case of Atlantic Canada

Telecommunications Services and Regional Development:
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by

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and
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Foreword

The relationship between technological progress and social change is one of the major issues facing Canada today. In this Canada is not alone, for the tremendous advance in communications and computer technology which we are currently experiencing is a global phenomenon, both in terms of the diffusion and the impact of the technology. The result is an unprecedented global interdependence as modern communications technology makes a call around the world as easy as one across the street and as the increasing volume of voice, graphic and data traffic crosses borders unseen and virtually undetected.

In its workplans, the Institute for Research on Public Policy has, for more than a decade, attached great importance to research on the relationship between technology and society. The current work of the Institute includes, *inter alia*, studies of informatics trade, the labour market for knowledge and information workers, trade in services, the future of universities, and the relationship between information and organizational structure. What is becoming clear from this work, as the research progresses, is that the economic and social impact of information technology will not, without conscious policy direction, be the boon to mankind which the futurists of 20, and even 10 years ago, were telling us it would be.

One of the early forecasts of the impact of communications technology on Canada's less advantaged regions was made in a study for the 1971 Telecommission. That report argued that economic development in such regions would be stimulated as communications afforded a means of overcoming the disadvantages otherwise posed by distance from the major economic centres. But, when evaluating this assertion, we must remember the truism: possibility and probability are not the same thing.

There is no question that information technology makes many economic activities independent of distance and, therefore, in principle, independent of location . In theory, data centres for a bank or an insurance company or data base services for farmers or lawyers, etc. are economic activities which, with appropriate communications links in place, could be anywhere. But in fact, location outside existing centres seems unlikely unless external factors, other than those dependent on the technology, are brought into play.

The essential question to be posed is whether, on balance, information technology will ultimately be centralizing or decentralizing in terms of economic activity. Barry Lesser and Pam Hall, in this study of *Telecommunications Services and Regional Development: The Case of Atlantic Canada*, argue that, left to market forces on their own, the technology is most likely to be centralizing. And there is some evidence to suggest less-advantaged regions are already becoming more disadvantaged relative to the more prosperous central regions of Canada owing to information technology. But Lesser and Hall also argue that this result need not be inevitable. Through appropriate policy actions by government, there could yet be a relatively positive impact on Canada's less-advantaged regions.

This conclusion underlines a theme which has emerged from much of the Institute's work on the information economy. This theme has been emphasized on several occasions in various talks on communications technology and information policy. And it remains a point which continues to be underscored by our research results – that there are legitimate and pressing economic reasons and social reasons for an essential government role in the information economy.

The problem of regional economic disparities in Canada has been both prominent and intractable for a very long time. It is a problem which has both economic and social dimensions, and one which is closely linked to our sense of a national identity. As Ronald Watts observed, in a paper contained in the 1981 Institute study *Regionalism and Supranationalism*,

> . . . regional disparities in wealth can be one of the most explosive forces politically, particularly when these

> disparities coincide with linguistic and cultural cleavages. Indeed, many ostensibly linguistic, social, or cultural movements for greater regional autonomy or even political separation in countries such as Canada . . . have had strong economic undercurrents related to the struggle for jobs and economic opportunities.

The regional implications of the information economy transcend Atlantic Canada. They are also important to the country as a whole. The contention of the authors in this study is unsettling in this regard. Information technology, if not mastered through appropriate policy action by government, threatens our national survival in a number of ways; the regional dimension of this threat may be one of the most important.

It was noted earlier that the information economy is a global phenomenon. Thus, the same concerns for centralization versus decentralization which Lesser and Hall describe for regions within Canada arise for Canada within the global economy. It is possible that our competitive position internationally may dictate greater centralization while regional interests call for greater decentralization.

Such a conflict between national and regional interests may not be inevitable. But whether it materializes or not, the more general point which is underlined by the potential for such conflict is the need for regional interests to be addressed within, indeed to be integrated in, a national informatics policy framework. This is a major recommendation of Lesser and Hall. They argue that a national policy framework, which includes regional considerations as an integral element, is a prerequisite to effective regional policy initiatives in the area of informatics.

This recommendation echoes a more general comment made by The Honourable Robert L. Stanfield, Chairman of IRPP, in the Foreword to the Institute's recent publication *Still Living Together: Recent Trends and Future Directions in Canadian Regional Development*. Mr. Stanfield suggests in his Foreword that regional development policy in Canada has not been sufficiently integrated with the mainstream of national economic policies, that we have relied too much on explicit regional policies rather than being concerned with the regional implications of broader national policies and activities.

Canada is one of the few countries in the world, perhaps the only one, to have a specific constitutional commitment to regional development. Information policy promises to be one of the most crucial areas of policy concern in the years ahead, and it is an obvious place to start building the kind of integrated approach suggested by Mr. Stanfield and strongly endorsed by Lesser and Hall.

The Institute is pleased to publish this study dealing with the information economy and regional development. We are also pleased to acknowledge the financial assistance we have received in this undertaking from the four major telecommunications carriers in Atlantic Canada: Island Telephone, Maritime Telegraph and Telephone, New Brunswick Telephone, and Newfoundland Telephone. The question which the study poses is important. We hope that the publication of this study will play some part in prompting greater attention to the problem and the search for some concrete answers. The undertaking of this study and its publication reflects the Institute's continuing commitment to promoting greater understanding and informed public debate of the economic and social impact of technological change.

A.R. Dobell
President

January 1987

Avant-propos

Le rapport entre les progrès technologiques et la transformation de la société est un des problèmes majeurs auxquels le Canada doit faire face de nos jours. Ceci n'est d'ailleurs pas propre au Canada; les progrès considérables que l'on observe dans le domaine des communications et de l'informatique sont un phénomène global, tant pour ce qui est de l'impact que de la diffusion des nouvelles technologies. Il en résulte une interdépendance planétaire sans précédent: grâce à la technologie des communications, il est aujourd'hui aussi facile de téléphoner aux antipodes qu'en face de chez soi, et de plus en plus de renseignements traversent les frontières, sous forme orale et graphique, virtuellement incognito.

Depuis plus d'une décennie, l'Institut de recherche politique attache une grande importance à la recherche sur les relations entre société et technologie. Les travaux en cours portent, entre autres, sur le commerce de l'informatique, sur le marché du travail pour les spécialistes du savoir et des techniques d'information, sur les services d'échange, sur l'avenir des universités et sur les relations entre les structures informatisées et organisationnelles. Ce que les recherches montrent clairement, c'est que, sans une politique de planification concertée, l'impact économique et social de la technologie de l'informatique ne pourra devenir cette manne pour l'humanité que nous prédisaient les futuristes d'il y a dix ou vingt ans.

Un des premiers pronostics, quant aux effets de l'information sur les régions canadiennes les moins favorisées, est apparu dans une étude pour la Commission des télécommunications de 1971. On y lit que le développement économique de ces régions se verrait stimulé par le progrès dans les communications, ce qui permettrait de compenser leur éloignement des grands centres économiques. La réalité actuelle nous remet en mémoire cette vérité que prévoir et réaliser sont deux choses bien différentes.

Certes, grâce à l'informatique, nombre d'activités économique sont devenues indépendantes des distances et par conséquent de la situation géographique. Ainsi, les centres de données pour les banques et les compagnies d'assurance, les services de renseignements informatisés pour les agriculteurs, les hommes de loi, etc., devraient pouvoir, en théorie et avec l'infrastructure adéquate, être établis n'importe où. En fait, l'installation de tels systèmes en dehors des centres existants est pratiquement impossible si n'entrent en jeu des facteurs externes autres que d'ordre technologique.

La question essentielle demeure de savoir si, en définitive, la technologie de l'information centralise ou décentralise l'activité économique. Barry Lesser et Pam Hall, dans l'étude intitulée *Telecommunications Services and Regional Development: The Case of Atlantic Canada* (Les services de télécommunications et le développement régional: l'exemple du Canada de l'Atlantique), soutiennent que si cette technologie est laissée à l'influence des forces du marché, elle aura, selon toute vraisemblance, des effets centralisateurs. Certains indices permettent déjà de penser que, du fait de l'informatisation, les régions les moins favorisées sont en train de devenir encore plus désavantagées par rapport à celles privilégiées du Canada central. Ces auteurs ajoutent cependant que la situation n'est pas irrémédiable: une politique appropriée pourrait encore permettre aux régions canadiennes les moins favorisées de connaître des jours meilleurs.

Ce point de vue met en valeur un thème que l'on retrouve dans la plupart des travaux de l'Institut sur l'économie de l'information. Ce thème a fait l'objet de divers entretiens sur la technologie des communications et la politique de l'information. Comme les résultats des recherches continuent de le souligner, des raisons économiques et sociales légitimes et pressantes exigent une intervention gouvernementale majeure dans l'économie de l'information.

Depuis bien longtemps déjà, le problème des disparités régionales au Canada est évident et difficile à résoudre.

Etroitement lié à notre sentiment d'identité nationale, il présente des dimensions économiques et sociales. Ainsi que le remarque Ronald Watts dans un article publié en 1981 dans un ouvrage de l'Institut intitulé *Regionalisme and Supranationalism* (Régionalisme et supranationalisme):

> ... les disparités régionales en matière de richesses peuvent être l'une des forces politiques les plus explosives, notamment quand elles coincident avec des différences linguistiques et culturelles. En fait, dans les pays comme le Canada, beaucoup de mouvements ostensiblement linguistiques, sociaux ou culturels à la recherche d'une plus grande autonomie régionale, ou même d'une indépendance politique... ont eu, à l'arrière-plan, de fortes tensions économiques reliées à la rareté de l'emploi et à la faiblesse du potentiel économique.

Les effets de l'économie de l'information ne s'arrêtent pas aux provinces de l'Atlantique; l'ensemble du pays est concerné et, de ce point du vue, la thèse de Lesser et Hall est préoccupante. La technologie de l'information, sans une politique gouvernementale appropriée, menace de bien des manières notre survie en tant que nation, et la dimension régionale de cette menace est peut-être l'une des plus importantes.

Le caractère global de l'économie de l'information a déjà été souligné. Cela implique que les mêmes préoccupations devant les forces en jeu, centralisatrices contre décentralisatrices, évoquées par nos auteurs dans le contexte régional canadien, se retrouvent dans le contexte mondial. Il est possible que les exigences de la concurrence internationale nous dictent qu'une plus grande centralisation serait souhaitable, alors que nos intérêts régionaux réclament le contraire.

Un tel conflit n'est pas forcément inévitable. Mais qu'il se matérialise ou non, le fait qu'il soit possible rent d'autant plus nécessaire le réglement des problèmes régionaux à l'intérieur d'une loi-cadre, prenant en compte, à l'échelle nationale, toutes les questions de politique de l'informatisation. Lesser et Hall en font une de leurs recommandations principales. Ils soutiennent que, pour être efficaces, les initiatives de politique régionale dans le domaine de l'informatique doivent pouvoir s'intégrer dans un ensemble concerté de mesures générales, décidées au niveau national et compte tenu des considérations régionales.

Cette recommandation n'est pas sans rappeler un commentaire plus général formulé par l'Honorable Robert L.

Stanfield, président du Conseil d'administration de l'Institut, dans l'avant-propos d'une publication récente: *Still Living Together: Recent Trends and Future Directions in Canadian Regional Development.* M. Stanfield y exprime l'opinion que la politique de développement régional du Canada n'a pas été suffisamment intégrée à l'ensemble de la politique économique nationale; nous nous sommes trop appuyés sur des politiques régionales explicites, sans nous préoccuper des effets implicites au niveau régional des activités et des politiques nationales.

Le Canada est l'un des quelques pays au monde, et peut-être le seul, à avoir une obligation constitutionnelle spécifique envers le développement régional. La mise sur pied d'une politique adaptée à une société informatisée promet d'être une des préoccupations politiques majeures des années à venir. C'est le moment ou jamais d'essayer de créer cette approche intégrée suggérée par M. Stanfield et fortement recommandée par Lesser et Hall.

L'Institut est heureux de présenter cette étude sur l'économie de l'information et le développement régional, et c'est avec gratitude qu'il remercie les quatre principaux organismes de télécommunications de la région de l'Atlantique pour l'aide financière apportée à la réalisation de cette publication, à savoir: Island Telephone, Maritime Telegraph and Telephone, New Brunswick Telephone et Newfoundland Telephone. La question posée par l'ouvrage de Lesser et Hall est d'importance, et nous espérons que la sensibilisation du public à ce problème en sera facilitée, de même que la découvertede solutions concrètes. La réalisation de cette étude ainsi que sa publication témoignent une fois de plus de l'engagement de l'Institut envers sa mission, qui est de permettre une meilleure compréhension et une discussion mieux informée, relativement à l'impact économique et social des changements technologiques.

A.R. Dobell
Président

Janvier 1987

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Executive Summary

The advent of the information age is propelling the Canadian economy and society towards major structural, transformative change. The question of how the benefits of this change will be shared among Canada's regions is an important one which has not, however, received much attention to date.

In considering the regional impact of the information economy in Canada, the telecommunications sector occupies a central position. For less developed, so-called periphery, regions, telecommunications could provide a means of compensating for disadvantages of location otherwise posed by distance. As Canada moves toward an economy where information and information-related activities are increasingly important, the ability of the telecommunications system to assist less-developed regions in this fashion will make it increasingly important to regional economies. This impact, however, is not assured.

In theory, telecommunications infrastructure may promote either a centralization or a decentralization of economic activity on a regional basis. A modern up-to-date telecommunications infrastructure is a necessary but not sufficient condition for periphery regions to gain both absolutely and relative to centre regions in terms of economic development.

The way in which the telecommunications network is applied as well as the terms and conditions under which it is made available for use will be primary determinants of the economic impact of the network on a given region. But the technology itself will be neutral with respect to the regional distribution of benefits. In a free market environment, it is other characteristics of the region (labour force characteristics, industrial structure, diffusion of complementary technologies, size, etc.) which will primarily decide the outcome. In this case, as between periphery regions and centre regions, the potential for greater centralization of economic activities and of information resources themselves is very real. The process, moreover, is self-reinforcing — increased centralization will beget even greater centralization.

Insofar as telecommunications in the information age promotes a greater centralization of economic activity, existing regional economic disparities in Canada will be exacerbated. To alter this result will require government action, both directly and indirectly through acting in concert with the private sector.

Using Atlantic Canada as a case study region for analysis, it is evident that the Atlantic provinces are not in a good position in a number of important respects to take advantage of the development of the information economy. The failing, moreover, is not a function of an inadequate telecommunications infrastructure. The telecommunications system in Atlantic Canada, in general, is approximately in line with the system elsewhere in Canada, so the problem lies in such things as a lagging diffusion of complementary technologies, notably computers, and in the attributes of the region's economies, labour force and demographic characteristics.

An examination of some individual firm/sector experiences in Atlantic Canada underlines these various arguments in a more concrete, albeit illustrative, way. The crucial role of telecommunications for regional firms serving a wider market is underlined at the same time as it is made clear that telecommunications, by itself, is not a sufficient condition for establishing a competitive advantage.

What the firm/sector-specific cases do not show precisely because they are specific, is the aggregate impact of the technology on the region. In this regard, the previously stated conclusion is underlined: in practice, as the information economy develops, the Atlantic provinces will lose in relation to other regions if market forces alone are left to decide the outcome; to alter this result, government action is required.

The forms of government action which are called for are various.

First, it is important that there be a national policy framework within which to fit regional policies. Such a national framework is lacking at present and should be a priority of the federal government both because of the intrinsic importance of the development of the information economy to the national economy as well as the interdependence of national and region-specific concerns.

Second, government policy must focus on the application or content side of the information economy, not on the hardware or equipment manufacturing side. The latter is not unimportant. It is the former, however, which will determine the type and pace of economic and social change which emerges as the information economy unfolds.

Third, it is vital that government policy-makers recognize the potential of information activities as a vehicle for redressing regional economic disparities and that they also recognize that, without deliberate effort by government, the technology very well may exacerbate regional disparities.

A number of specific policy initiatives can be considered.

For example, a system of telecommunications subsidies might be instituted in the Atlantic region comparable to the freight subsidies offered under the Maritime Freight Rates Act and successor legislation. Of prime importance is the fostering of an environment within which private sector initiatives related to information based activities can take hold.

The role of the private sector is important. Government is not a substitute for private entrepreneurship. It is business in the region that must use the technology and the information activities and resources it delivers, for the region to benefit from the information age. This implies a collaborative and a supportive role for government vis-à-vis the private sector.

Such a role for government means: providing information on new technologies; researching applications of the technology; counselling business; and providing mechanisms for joint or shared use of the technology by small and medium size businesses. It means providing appropriate infrastructure support, training and retraining programs. It means fostering a research and development focus in the region, using the relatively rich post-secondary education base already present.

These are all examples of specific areas for government action. If the benefits of the information economy are to be shared by all of Canada's regions, government must recognize that such action is required.

The industrial age of the last century, in relative terms, by-passed what are now Canada's less advantaged regions. The challenge and the opportunity of the information age will be to keep this result from being repeated.

Abrégé

L'avènement de l'ère de l'information est en train de propulser l'économie et la société canadiennes vers des changements structurels et transformationnels importants. Comment les différentes régions du Canada vont-elles se partager les bénéfices qui découlent de ces changements? C'est là une question d'importance capitale, qui pourtant ne semble pas, jusqu'ici, avoir beaucoup retenu l'attention.

Les télécommunications représentent un élément important des effets régionaux de l'économie de l'information au Canada, car elles pourraient bien être le moyen de compenser les désavantages causés par l'éloignement de certaines régions peu développées, communément appelées régions périphériques. L'importance de l'information et des activités qui s'y rapportent grandit de jour en jour au sein de l'économie canadienne, et le développement de l'économie régionale va dépendre de plus en plus des services que pourra fournir le réseau des télécommunications à ces régions peu développées. Toutefois, cet effet n'est pas garanti.

En théorie, l'infrastructure des télécommunications peut entraîner soit une centralisation, soit une décentralisation des activités économiques d'une région donnée. En fait, bien qu'il soit évident que l'infrastructure des télécommunications doive être modernisée, il en faudra davantage pour que le développement économique absolu et relatif des régions périphériques devienne comparable à celui des régions centrales.

C'est la manière dont le réseau des télécommunications sera mis en service, de même que les termes et conditions en vertu desquels il fonctionnera, qui détermineront les effets économiques de ce réseau sur une région donnée. La technologie elle-même jouera un rôle neutre, quant à la distribution régionale des bénéfices. Dans un environnement de marché libre, le résultat final sera fonction des autres caractéristiques de la région en question (main d'oeuvre, industrie, diffusion d'autres technologies, importance, etc.). Dans ce cas, de même que dans les rapports entre les régions centrales et périphériques, il existe une réelle possibilité d'accroissement de la centralisation des activités économiques et des ressources d'information elles-mêmes. De plus, c'est un processus qui se renforce par lui-même: l'augmentation de la centralisation ne pourra qu'engendrer une centralisation encore plus grande.

Dans la mesure où, à l'ère de l'information, les télécommunications favorisent la centralisation des activités économiques, on peut s'attendre à ce que les différences économiques qui existent à l'heure actuelle entre les régions ne fassent qu'augmenter à l'avenir. Pour changer cela, il faudrait que le gouvernement agisse, directement aussi bien qu'indirectement, en coopération avec le secteur privé.

Si l'on prend le Canada de l'Atlantique comme région modèle pour faire une étude de cas, il apparaît clairement que les provinces de l'Atlantique sont à l'heure actuelle en mauvaise posture, à bien des égards, pour pouvoir profiter pleinement du développement de l'économie de l'information. Ce n'est pourtant pas que l'infrastructure des télécommunications soit inadéquate. Le système des télécommunications du Canada de l'Atlantique est, en général, comparable à celui du reste du Canada. Le problème vient plutôt de choses telles qu'un certain retard dans la diffusion de technologies complémentaires, en particulier des ordinateurs, et des attributs de l'économie, de la main d'oeuvre et des caractéristiques démographiques de la région.

L'examen des expériences de certaines firmes et de certains secteurs du Canada de l'Atlantique renforce ces arguments et les illustre d'une manière plus concrète. L'importance du rôle joué par les télécommunications pour des firmes régionales dont le marché s'étend hors de leur région est évident, mais on comprend également que les télécommunications à elles seules ne puissent pas suffire à donner à ces firmes un avantage sur leurs concurrents.

Ce que cet examen ne montre pas, précisément parce qu'ils sont si spécifiques, ce sont les effets globaux de la technologie sur la région. A ce propos, la conclusion préalablement énoncée est mise en évidence: dans la pratique, plus l'économie de l'information va se développer, plus les provinces de l'Atlantique vont perdre du terrain par rapport aux autres régions, si le résultat final est laissé aux seules forces du marché. Pour qu'un changement s'opère, le gouvernement doit intervenir.

Le gouvernement peut agir de plusieurs manières.

Tout d'abord, il est important d'établir une politique nationale, sur laquelle pourront se greffer les politiques régionales. L'absence d'une telle politique nationale se fait sentir à l'heure actuelle, et c'est sur cette question que le gouvernement fédéral devrait se pencher en priorité, car non seulement le développement de l'économie de l'information est d'une importance intrinsèque pour l'économie nationale, mais encore parce que les problèmes nationaux et ceux qui sont spécifiques aux régions sont intimement liés.

De plus, c'est sur les questions d'application ou de contenu de l'économie de l'information que le gouvernement devrait concentrer ses efforts, plutôt que sur les questions de matériel ou de fabrication de matériel. Non pas que ces dernières questions soient sans importance, mais le type de changements sociaux et économiques et le rythme selon lequel se produiront ces changements seront déterminés par le développement de l'économie de l'information.

Enfin, ceux qui élaborent les politiques gouvernementales doivent se rendre compte que les activités liées à l'information vont jouer un rôle vital dans le redressement des disparités économiques qui existent entre les régions, et que, sans effort délibéré de la part du gouvernement, la technologie risque fort d'exacerber ces disparités.

On peut envisager un certain nombre d'initiatives politiques.

Par exemple, un système de subventions des télécommunications pourrait être institué dans la région de l'Atlantique, comparable aux subventions de transport accordées en vertu de la Loi sur les tarifs de transport des Maritimes et la législation des successeurs. Il serait important d'entretenir un environnement au sein duquel les initiatives du secteur privé se rapportant à l'information puissent se concrétiser.

Le rôle du secteur privé est important. Le gouvernement n'est pas un substitut de l'entreprise privée. Si l'on veut qu'une région donnée profite pleinement des avantages apportés par l'ère de l'information, les entreprises de cette région doivent se servir de la technologie, des activités liées à l'information et des ressources qu'elle produit. Ceci implique un soutien du gouvernement envers le secteur privé.

Pour jouer ce rôle, le gouvernement doit: fournir des renseignements sur les nouvelles technologies; faire des recherches sur l'application de ces technologies; donner des conseils aux entreprises; mettre au point des mécanismes qui permettent aux petites et moyennes entreprises de partager l'usage des technologies. Bref, apporter le soutien approprié à l'infrastructure, aux programmes de formation et de recyclage et encourager la recherche et le développement, en mettant à contribution les connaissances des nombreux universitaires qualifiés de la région.

Ce sont là des exemples de ce que pourrait entreprendre le gouvernement. Pour qu'un partage équitable des bénéfices de l'économie de l'information entre toutes les régions du Canada soit possible, le gouvernement doit se rendre compte qu'il est essentiel que de telles actions soient entreprises.

L'ère industrielle du siècle dernier avait en quelque sorte contourné certaines régions du Canada, régions qui sont aujourd'hui défavorisées. Le défi et les possibilités de l'ère de l'information seront d'éviter que ce phénomène se reproduise.

Chapter 1:

Introduction

> The telephone and the information network it represents have become something else—one of the world's most effective productivity raisers . . . corporate telecommunications is moving out of the controller's hands and into the chief executive's: what used to be a cost of doing business is becoming a source of competitive advantage and profit.
>
> Twenty years ago telecommunications was one of the world's most boring industries. Economics and technology have turned it into one of the most exciting. It has become a key to the biggest industrial change of the next few decades: the developed world's shift to an information economy.[1]

These quotations come from *The Economist*. Comparable statements could have been found in more "scholarly" publications. *The Economist* was chosen as a source, however, to demonstrate that talk of the information "revolution" has reached beyond the realm of futurists and scholars. The revolution is a fact which is upon us.

In the midst of this transformation of the telecommunications industry into one of the most dynamic and important sectors of our economy, relatively little attention has been paid to its implications for the economic and social development of different regions within a country. Rather, most discussion has been focused at the national level.

Telecommunications, even "plain old telephone service" (POTS), may influence the spatial distribution of economic activity in a country. For less developed regions, it provides the possibility of a cost-effective and efficient means of overcoming some of the disadvantages posed by distance, allowing greater economic and social development through greater integration with other regions.

The introduction of a new generation of telecommunications technology, much of it computer-based, and the combination of computer and communications technology at the user level introduce a whole new set of functional applications for the telecommunications network. Together, these could produce an exponential increase in the impact of telecommunications on the economic and social life of Canadians. How this impact will be spread across regions is of major importance.

Relatively remote, less-developed regions are typically those put at the greatest disadvantage by distance from markets, and having the fewest transportation options, more expensive transportation, and small local economies (markets). If telecommunications positively influences the social and economic development of regions by compensating for the disadvantages posed by distance, then this influence should be greatest where such disadvantages are greatest.

On the other hand, the technology could also promote a centralizing tendency, allowing firms in the already dominant regions to penetrate periphery region markets more effectively, driving out local producers, forestalling any competitive threat from periphery regions and exacerbating existing economic disparities. The centralization of both economic activities and information itself are concerns in this regard.

The question of whether less developed, periphery regions are likely to win or lose in relation to the country at large in the transition to an information economy and the question of the role of government policy in promoting a positive result for periphery regions are the issues with which this study is concerned.

In Canada, regional economic disparities are a long-standing problem, dating back to the time of Confederation. Despite considerable effort and expenditure by governments in Canada in the last 25 years, the problem of regional disparities not only remains but has not been significantly reduced. This does not mean that regional development policy has had no effect; regional disparities might well have grown worse in the absence of the federal and provincial development initiatives of the past

25 years. Certainly, however, regional development policy has not succeeded in rolling-back regional disparities to any significant degree over this time.

Regional development policy in Canada typically (1) has not included the telecommunications sector within the range of infrastructure projects that have been a major focus of regional policy and (2) has not emphasized service or tertiary sector activities versus primary and secondary sector activities. Parts of the service sector are among those parts of the economy potentially best suited to take advantage of the new computer-communications technologies and services. Thus, the potential role of telecommunications and telecommunications-based services in promoting regional development and the consequent use of telecommunications as an instrument of regional development policy so far have not been well recognized or heeded by policy-makers.

In Atlantic Canada, which is the country's poorest region, this situation has been as true as for Canada as a whole. Atlantic Canadians have not suffered, in consequence, from a poorly developed telecommunications network. Indeed, as the profile of telecommunications carriers and services in later chapters makes clear, the carrier network in Atlantic Canada is roughly comparable to the country as a whole. Atlantic Canadians may have suffered from a failure to make use of the network in an optimal way. If true, this is a direct reflection on regional development policy-makers. It is also a reflection on the region's telecommunications carriers who, in an environment of regulated monopoly, have not been particularly aggressive in their marketing efforts. While the carriers themselves have kept well abreast of technological developments regarding telephone transmission, switching and customer equipment, users have not necessarily kept abreast or been kept abreast of network capabilities or of technological developments in other fields (e.g. computers) which are complementary to the telecommunications network. Users have also often lacked the knowledge or the means to make use of these technologies, even when aware of them.

The contribution which the telecommunications sector makes to the regional economy of Atlantic Canada is twofold: the direct impact on income and employment (including the attendant multiplier effects) from activity within the telecommunications sector itself; and the indirect effects which telecommunications has via the benefits derived from its availability and use which are not captured in the prices paid for service.

It is with these indirect effects that this study is most concerned; they represent the developmental impact of telecommunications. Whether they are positive or negative for a particular region depends on whether the technology, on balance, promotes decentralization or centralization of economic activity. If the former, less developed regions stand to gain in relative terms; if the latter, less developed regions stand to lose in relative terms. Which tendency dominates will depend not directly on the technology, which theoretically can produce either effect, but on the characteristics of the regional economies in question. These characteristics, together with public policy, will determine the substance and timing of applications of the technology.

Chapter Two sets out profiles of the economies of the Atlantic provinces and of the telecommunications sector of the Atlantic provinces. This profile demonstrates both the relatively disadvantaged economic position of the Atlantic provinces vis-à-vis Canada as a whole and the relatively well-developed physical network and service offerings of the major regional telecommunications carriers. The fact that the telecommunications infrastructure is relatively well-developed while the economy remains relatively underdeveloped does not refute the proposition of a link between telecommunications and regional development. First, the regional economy could have been worse off without the relatively well-developed telecommunications sector it has. Second, part of the picture of high telecommunications sector development may be biased by the dominance of urban services, i.e., rural areas in each province do not always share equally in telecommunications sector developments. Third, the emergence of many of the "enhanced services" described in Chapter Two is relatively new; these services have not yet had a chance to exert a major effect. Fourth, to state the obvious, a well-developed telecommunications infrastructure is not a sufficient condition for growth in the Atlantic provinces or any other region. Many factors impact on the growth of a region. A simple correlation (or lack of correlation) between telecommunications infrastructure and the economic status of the Atlantic provinces takes no account of the myriad dynamic factors which impact on the growth of a region. Fifth, it is the use of the system, not the system itself, that matters in terms of economic development. A well-developed physical structure is no guarantee of use.

All of these arguments indicate that no hasty conclusions can be reached on the basis of the apparent lack of correlation between aggregate indicators of relative economic well-being and the relative development of the telecommunications infrastructure. But the characteristics of telecommunications also make it impossible to predict whether a positive correlation should ever be expected. Telecommunications is a two-way medium of information transfer and, as such, the benefits which it produces may accrue to either end of the connection or disproportionately between the two ends. The indirect benefits of telecommunications development do not necessarily accrue to the location of the physical plant or in direct proportion to the spatial distribution of the physical plant. As the theoretical framework of Chapter Three makes clear, new plant construction in Atlantic Canada could produce more indirect benefits in Ontario or British Columbia than in Nova Scotia or Newfoundland.

Chapter Four examines some actual experiences of Atlantic Canada users in the form of four case studies of firms or sectors in the Atlantic economy. This analysis, while only illustrative because of the few cases examined, shows, nonetheless, the types of general development benefits which can be derived from telecommunications. It also illustrates examples of missed opportunities resulting from delays in the adoption of new technology, lack of awareness of network capabilities, and so on.

Such problems are not insoluble, as the policy discussion of Chapter Five points out. A variety of initiatives can be taken by users, carriers and government to promote a greater development impact from telecommunications in the Atlantic provinces. New telecommunications technologies and services are turning the world, including Canada and all its regions, into an increasingly interdependent unit. Talk of the "global village" which, when first heard 20 years ago, was a dream, is now technologically a reality. If in practice it still falls short of full realization, it is because of political, economic or social barriers, not technological barriers. Moreover, these political, economic and social barriers are also gradually being eroded. In the face of this global and national development, disadvantaged regions such as Atlantic Canada cannot afford to ignore the potential of this technology. What they also cannot afford is a cavalier attitude that they will automatically benefit from this development. The potential is there, but it must be harnessed in a quite conscious and deliberate fashion if it is to be realized.

As was noted by the 1979 UNESCO report *Many Voices, One World*,

> At the same time, the information, data and knowledge transmitted by different processes represents an increasingly important factor of development. For growth increasingly results from the conjunction of

> limited material resources and unlimited non-material resources (education, know-how, information)[2]. . . .
>
> Both in its structures and its content, communication intermeshes with, and is dependent on, the economy in many ways. A constant flow of information is vital for economic life. As well as being a great economic force with incalculable potentialities, it is a decisive factor in development. As an element of increasing importance in all national economies, communication represents a growing segment of a country's gross national product and has direct repercussions on productivity and employment. In particular, advances in telecommunications bring about instant transmission of information and thus, in some places, dispense with skilled labour, while in others modify its nature. It is communication that now holds out the best prospects of growth in industrial societies and can be seen as the pivot of the world economy. Modern communication means make the site of enterprises often irrelevant, permit transfers to distant area of many factories, or a freer choice of locations for different industries and other sorts of activities, such as trade, banking and airlines. The ordinary man feels, even though he does not control, the crucial part played in the economy by communication and information.[3]

For national economies, the implications of statements such as these are multiple and complex. For regions within countries, the complexity is even greater.

For the regional implications of information technology to be appropriately addressed requires a national strategy which is sensitive to regional concerns. As noted by Amin and Goddard,

> A renewed national industrial strategy, if kept separate from a regional policy which continues simply to ameliorate the consequences of industrial decline or promote the development of small high-technology firms, is likely in fact to widen the regional gap for three reasons: In the first place, action at a national level is most likely to favour the strongest sections of the economy which tend to be located in the most prosperous regions. Secondly, a blanket industrial strategy will not be sensitive to regional specific problems and needs. Finally, a regional policy confined to a narrow set of

> initiatives will come nowhere near confronting the enormity of the economic and social problems facing the lagging regions.[4]

In addressing the question of telecommunications services and regional development in Atlantic Canada, this study attempts at least a beginning at the consideration of a regional strategy for the information economy in Canada. What it argues is that the new information age holds great promise as a window of opportunity for addressing the problem of regional disparities in Canada. But if this potential is to be realized, if the new information age is not to by-pass less advantaged regions in the relative sense that has been true of the industrial age, governments responsible for regional development policy must recognize the potential and take appropriate actions to realize it. The information age *can* be of benefit to all regions. But left solely to market forces, the results are likely to be relatively, if not absolutely, against the lagging regions. In this case, regional disparities will be exacerbated even further than at present. To alter this outcome, then, is the challenge for public policy.

Notes

1. "The world on the line", *The Economist*, November 23, 1985, p. 5.

2. UNESCO, *Many Voices, One World*, Report of the McBride Commission, 1979, p. 227.

3. *Ibid.*, pp. 23-24.

4. A. Amin and J.B. Goddard, "The internationalization of production, technological change, small firms and regional development: an overview" in A. Amin and J.B. Goddard (eds.), *Technological Change, Industrial Restructuring and Regional Development*, (London: Allen and Unwin, 1986), p. 21.

Chapter 2:

Profile of the Atlantic Economy and Telecommunications Sector

Atlantic Canada is made up of the four provinces of Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island. It is Canada's easternmost region, with all four provinces touching on the Atlantic Ocean. In this chapter, we present a demographic and economic profile of the region and a profile of the telecommunications sector, including a taxonomy of present and planned telecommunications service offerings. The annex to Chapter Two presents the detailed tables and their description on which the discussion in this chapter is based.

Demographic Indicators

As of 1984, the combined population of the Atlantic provinces was approximately 2.3 million people, representing about 9% of the Canadian total.

Within this regional total, Newfoundland's population was 579,000, Nova Scotia's 869,900, New Brunswick's 713,000 and Prince Edward Island's 125,300. The age distribution of the population in all four provinces shows an average tendency to more of the youngest and the oldest age groups, compared with Canada as a whole. Thus, there is a relative under-representation of persons between 20 and 60 years old, the population group which comprises the bulk of the labour force. (Table A2.1.)

On rural-urban basis, urban growth has in recent years been slower than rural growth for each of the four provinces. Indeed, in the New Brunswick case, the urban population has experienced an absolute decline. This is in contrast to the national picture where, overall, urban growth has been greater than rural. (Table 2.2.)

Finally, the average level of education attainment in Atlantic Canada, as of 1981, was below that of the country as a whole, with the sharpest difference experienced in a lower proportion of high school completions. (Table A2.3.)

Labour Force Indicators

Unemployment rates in Atlantic Canada typically are higher than for the country as a whole, while the labour force participation rate and the employment/population ratio are both lower than the national average. (Table A2.4.)

A breakdown of the labour force by sex and selected occupations (Table A2.5) shows an obvious importance of information-worker related categories (clerical, managerial, administrative, etc.) both nationally and provincially. Managerial positions, however, are less well represented at the Atlantic provincial level than nationally. So too are clerical workers. Clerical positions are dominant in the profile of female employment, both nationally and in the Atlantic provinces.

An industrial breakdown of employment (excluding agriculture) shows a below-national proportion of employment in manufacturing in all four Atlantic provinces. It also highlights the importance of business and personal services, which are at or above the national level in the Atlantic provinces. Finally, it highlights the importance of government, with public administration employment well above the national level in all four Atlantic provinces. (Table A2.6.) Professional occupational groups, however, are below the national average. (Table A2.7.)

Economic Indicators

The provincial GDP for the four Atlantic provinces for 1964, 1974 and 1982 shows this period to have been one of considerable extensive growth. (Table A2.8.) An examination of personal disposable income per capita for Canada and the Atlantic provinces, however, shows that per capita levels of income in Atlantic Canada remain well below the country as a whole and that the relative gap has not been narrowed since 1973. (Table A2.9.)

Wages and salaries for Canada and the Atlantic provinces from 1976 to 1983 show that the share of the total wage and salary bill of each of the Atlantic provinces stayed virtually the same over this entire period. (Table A2.10.)

The number of households and their average income for Canada and the Atlantic provinces are in accord with other income measures in terms of the relative position of the Atlantic provinces vis-à-vis Canada. (Table A2.11.) For family incomes, however, average incomes are lower while the proportion of families in the lower (below average) income groups is consistently greater in Atlantic Canada than in Canada overall. (Table A2.12.)

Profile of the Telecommunications Sector

Data on total telephones and telephones per 100 population in Canada and the Atlantic provinces show approximately equal levels of telephone development. (Table A2.13.) These provincial figures include all operating companies in a given province. This is most relevant in Newfoundland where Terra Nova Tel (TNT) and Newfoundland Tel both operate. Telephone density figures for all four provinces are somewhat below the country as a whole but by less than 10% of the national figure for 1983. Newfoundland is a greater exception, for reasons which may be explained by the economic and geographic circumstances of the province and different policies on the part of TNT and Newfoundland Tel. It is noteworthy that all four of the Atlantic provinces including Newfoundland have gained relative to the Canadian figures since 1975.

Figures on the breakdown of total telephones between individual, 2-party, 4-party, etc. show several trends (Table A2.14):

1. Individual residence main stations have been a major source of growth in total telephones since 1975.
2. Four-party service has grown at about the rate at which "more than four-party" service has fallen, reflecting the results of the carriers' rural improvement programs, which have set four party lines as the target maximum. In Newfoundland, Newfoundland Tel has a policy of two-party service as a maximum and provides more than single party service only on request.
3. Wide Area Telephone Service (WATS) has been slow to develop in the Atlantic provinces relative to the country as a whole.
4. Mobile units have not grown as fast in the Atlantic provinces as in Canada as a whole since 1975.
5. The growth of centrex and PBX units have more than kept pace with the country as a whole, outstripping the national picture by a small amount.

6. Finally, up to 1983, the number of extensions grew considerably, with residential extensions growing much more rapidly than business extensions. After 1983, extensions were no longer counted; total access lines become a more relevant indicator given the new jack installation policy adopted by the carriers in the early 1980s. The extension figures for 1982-1983 reflect the beginnings of this program and, therefore, may not be very meaningful.

A breakdown of total telephones by residence and business shows that the Atlantic provinces have kept approximate pace with the country as a whole, with the business/residential ratio moving downward in each province by about the same amount as nationally. (Table A2.15.)

Not surprisingly, business users are clearly concentrated relatively in the larger exchanges, as shown by the figures for residence and business in the larger exchanges versus the total province figures. (Tables A2.15 and A2.16.) In Newfoundland, Nova Scotia and Prince Edward Island, the growth rate in large exchanges has been greater than in small exchanges, although for P.E.I. the difference is quite small. It is also much larger in Newfoundland than in Nova Scotia. For New Brunswick, the situation is reversed, however. Exchanges over 25,000 population in N.B. between 1975 and 1983 grew at a much slower rate than exchanges under 25,000 (Table A2.16.) It should be noted that the definition of exchange boundaries may not be consistent over the period shown. Nor is it possible to draw a simple correspondence between exchange size and rural-urban population or geographic area.

While the division according to exchange size is *not* a good approximation of urban-rural population, it should reflect something of the urban-rural movement, however. The urban-rural shifts in N.B. from 1976 to 1981 (Table A2.2) may well explain part of the slower growth of large exchanges in N.B. (Table A2.16.)

An examination of operating revenues for telephones carriers in the Atlantic provinces for 1983 shows, first, that toll revenues outweigh local service revenues in all four provinces. Second, local service revenues are dominated by basic monthly subscriber charges. Third, private line services at the local level are relatively unimportant in terms of revenue. Fourth, telephone revenues dominate message toll revenues. Fifth, WATS generates significant revenues only for N.S. and N.B. (8.7% and 7.5% of total operating revenues respectively). Sixth, toll private line revenues are also significant only for N.S. and N.B.

On the expense side, the ratio of operating expenses to revenues are all close to one another for each province. A breakdown of expenses otherwise does not tell us very much at such an aggregate level, since items like maintenance, for example, will vary considerably depending on age and vintage of equipment, time of purchase, etc. (Table A2.18.)

The ranking of provinces by plant assets corresponds to the ranking by operating revenue and operating expenses. The ratios of outside plant to total plant and central office equipment to total plant are very close for P.E.I., N.S. and N.B. For Nfld., however, there is a relatively large divergence. (Table A2.19.)

A Taxonomy of Service Offerings

Table A2.20 shows a listing of service offerings available from the major telephone carriers in the Atlantic region. The labelling is that used by Telecom Canada members. It is important to note that similar services may also be offered by CNCP Telecommunications (or TNT in Newfoundland) under a different set of names. For example, Envoy Post from Telecom Canada and Telepost from CNCP are essentially the same as are TWX and Telex, or Teletex and Infotex, or Multicom and Telenet, etc., although the technical features of these services may vary slightly.

It is common to distinguish various services in terms of technical capability, such as, for example, distinguishing the type of message involved (voice, data, facsimile, image), or the way the service is provided (e.g. switched services versus dedicated services), or the type of equipment involved (paging, PABX, mobile radio, etc.) or the level of service "sophistication" (basic versus enhanced services).

These types of technical classifications, however, do not convey much information on how the services are utilized, i.e., what functions they perform. Moreover, the carrier-provided services listed in Table A2.20 are, in many instances, simply the carriage component of the functional application, i.e., the network service is simply the channel through which a desired application is achieved. Not only may there be various channels for achieving a given application but other elements may be necessary as accompaniments to the network service in order for the application to be realized.

In functional terms, we can distinguish five general types of communications services:

- information-retrieval services
- transactions services
- messaging services

- computing services
- monitoring services

These are generic classifications which are not equipment or network specific, although specific equipment or network features may be required to realize certain applications within these categories.

Traditionally, most carrier-provided telecommunications services fit into one or more of the categories of information-retrieval, computing and messaging. Many of the newest services or planned services now under consideration similarly fit into these categories, offering different and/or better ways of executing various applications within these categories. There is no particular reason, however, why most carrier services might not also fit into the monitoring and transactions categories. Indeed, interestingly, basic voice message telephone service, i.e., POTS, fits under all categories except, perhaps, computing. Voice telephone service can be used to relay information, to pass messages, to conduct transactions and to monitor certain events or activities. The only reason why more network services do not relate to transactions or monitoring services is that electronic applications in these areas have been slower to develop.

Setting out the various applications of electronic communications which fall under the five functional categories identified above (Table A2.21), demonstrates that thinking in terms of generic applications puts the issue of services in a quite different framework than does a technical classification. In the process several important conclusions emerge:

1. the same generic functions can be performed at various levels of technical sophistication;
2. the level of technical sophistication adopted will be in part a function of the network capabilities and/or the equipment utilized;
3. only the network capabilities, given the present structure of the telecommunications sector, are unique to the common carriers;
4. the same network may be the channel for all applications;
5. certain applications, at certain levels of technical sophistication, may require different networks. (e.g. a packet-switched data network);
6. electronic delivery of computerized services represents a new marketing channel for a variety of goods and services, to both business and residential customers, which otherwise already operate through alternative marketing channels;
7. all applications have alternative non-telecommunications-related delivery channels.

This last conclusion/observation is a particularly important one to emphasize since it underlines the thrust of categorizing services in terms of functional applications rather than as technical carrier offerings.

Consumers, whether business or residential buyers of telecommunications, do not buy telecommunications services for their own sake but rather because they allow them to do certain things more conveniently, or faster, or more reliably, or cheaper than the existing alternatives permit. One does not buy 800 service, for example, simply to have it but rather one buys the best way to allow a large number of calls to be made and charged to the receiver in the most convenient, easiest manner for the sender and at the lowest cost. At the moment that happens to be an inwats line or 800 service.

Future Service Offerings

Table A2.22 sets out a list of services planned by the Atlantic common carriers who are members of Telecom Canada. Dates of scheduled introduction may vary between companies but all have, or will soon have, the technical capability to make these offerings available.

This information is based directly on information supplied by the carriers. This is particularly interesting when one looks at the elements in the list.

Many of the items represent advances on existing carrier offerings and are of a general character similar to existing offerings. In other words, they are described in brand-name terms or technical terms and relate to features of the network and/or terminal equipment. A number of the listings, however, describe end products or uses, rather than network or equipment features. The network and terminal equipment must be appropriate to allow these applications to occur, of course, but beyond that the network/terminal equipment *per se* is incidental to the service. As the information economy advances, as new applications for computer-communications are developed and as the technology is increasingly adapted to provide new marketing channels for existing goods and services, it can be expected that there will be an increasing tendency to look at the market from this use or demand perspective, rather than a technical, supply perspective.

The second noteworthy point in this emerging trend for the carriers to describe services in functional terms, is that it demonstrates how, as the technology develops, one can expect to see a growing convergence of computers, communications and traditional service offerings. Along with this will also come a blurring of the lines of separation between producers in these different segments of the market. Electronic banking, for example, could be offered directly by banks, using the carrier network in a wholly transparent manner for distribution; it could be offered through independent service providers, whose link back to the bank's computer might be transparent and whose use of the carrier network would be transparent; or it could be offered by the carrier, through for example, a carrier gateway such as iNet, with the link to the bank transparent or not transparent.

Network Characteristics

As noted in the preceding discussion of service offerings and their classification, network characteristics may be important to the ability to offer certain services or permit the network to be used in certain ways. In order to comment on the availability of these services in Atlantic Canada, we need to know more about the characteristics of the network in the Atlantic provinces.

A variety of switching equipment of various vintages is used in the region. (Table A2.23.) Also there is considerable variation between companies (provinces) in the mix which is now in place. For Telecom Canada member companies (all but TNT in Table A2.23), the long range plan is for a fully digital system by the year 2007. In the meantime, many of the services described earlier cannot be offered in areas served by step exchanges or, in fewer cases, by crossbar exchanges.

In general the older equipment tends to be found in smaller exchange centres which in turn tend to be in predominately rural areas. This means that, while the full range of services described earlier are theoretically available throughout each province, in practice many rural areas (or smaller towns) may not be able to avail themselves of the full range of offerings and/or may have to pay more for certain services. In Nova Scotia, for example, there are eight exchange centres which provide a Datapac node. If one lives outside these eight centres, the Datapac service is still available but users must go through a private line or the switched toll network to get to the nearest Datapac node. An analagous situation prevails in the other provinces. Newfoundland, for example, has only two Datapac nodes.

By 2007, when the system aims to be fully digital, it also aims to provide a fully integrated, single network for voice, data and video. Once that point is reached, the network *per se* will become incidental to the range and availability of service offerings. Until that time, however, the network configuration within the province will influence the availability and accessibility of services across various parts of the province. In other words, the intra-provincial diffusion of the technology and services is a function of the network currently in place.

On the transmission facilities side of the carrier plant, present facilities are terrestrial-based systems, involving various combinations of microwave, coaxial cable, copper pair wire and fibre-optic cable. Satellites are included in the long-haul system only insofar as they are built into the Telecom Canada network configuration; they are not used intra-provincially on a dedicated basis at all. Fibre optics represent the major expansion focus for the future, both locally, intra-provincially and nationally, with an all-fibre transmission system from Halifax to Vancouver already announced by Telecom Canada.

Fibre systems will remove a major problem that the present system poses for a significant increase in data traffic through the public switched network, as opposed to leased line facilities, private data networks and public data networks such as Datapac. This problem is one of load capacity and speed or rate of transmission. A secondary problem for certain applications such as video or graphic services (e.g. videotex) is that, at the very least, a broadband cable usually must be used, i.e., ordinary copper pair wire will not normally work.

Again part of the implication of this is a function of the intra-provincial distribution of the transmission plant. And again it is the areas outside the major urban centres where the transmission plant vintage is oldest, where multi-party lines are highest, etc. Thus the availability of many services is either lower or the cost of availability higher for non-urban centres. It should be noted, however, that there are no incremental charges assessed for any tariffed service unless provision for such a charge is explicitly provided for in the published tariff schedule.

Price Features

A detailed discussion of actual prices for various telecommunications services would serve no particularly useful purpose here. In general, prices are *relatively* comparable across the region and follow the same general structure: a flat rate local service price with unlimited local calling; usage-sensitive rates for intra-and inter-provincial long distance; equipment charges based on either a lease or purchase price; and add-on charges for special features.

The price of local exchange service is based on exchange size (or the number of "network access services"), with the flat rate monthly charge rising as exchange size rises, within pre-set limits. Thus large urban exchanges pay a higher price than small rural exchanges. Also business service is distinguished from residential service with the former paying higher monthly charges for network connection than the latter.

The logic of this pricing structure is based on the presumed value of the service to larger exchanges and to business customers versus smaller exchanges and residential customers. As the discussion of externalities in the next chapter demonstrates, this *structure* (versus the actual *level* of prices) is theoretically justifiable on the basis that businesses derive greater secondary benefits (as defined in Chapter Three) from the use of the network than residences, on average, and that subscribers in large exchanges have a greater calling capability than those in smaller exchanges and therefore derive greater value from the system.

Despite this possible justification, it is true, however, that non-usage sensitive prices for local exchange service together with the increasing scale of charges as exchange size rises create a divergence between the price charged to incremental customers and the incremental cost of service, causing a cross-subsidization at two levels: from low volume users to high volume users within a given exchange and from large exchanges to small exchanges.

In addition, there is also further cross-subsidization in the system which takes place between local service and toll service. The former, historically, has been priced relatively low as a consequence of the universality principle which has been applied to the system by regulatory authorities. This principle, which calls for universal access at affordable prices, has been interpreted to mean that the price of local service must be kept within the reach of most members of society, constrained only by the need to guarantee the shareholders of the common carriers a fair rate of return. On this basis, long distance calling is left to carry a disproportionate share of system costs, thereby creating a cross-subsidization of local calling by toll calling.

A problem with this argument is that the local exchange network and the long distance network are joint components of a unitary integrated system. As such, any attempt to assign specific input costs to either component of the system can be considered arbitrary.

While this is a complex issue that has no easy answers, it is important in the face of emerging pressures for competition in the toll market and the consequent pressures this could exert for rate rebalancing between local and toll service. The possible consequences of this for the Atlantic region are discussed in greater detail in Chapter Five.

Computers

As a final point of discussion in this overview of both the economies of the Atlantic provinces and the telecommunications system of the Atlantic provinces, it is also useful to examine the diffusion of computers in the Atlantic provinces. In the information economy, computers are equally as important as the telecommunications network.

Data on computer installations by provinces in Canada from 1964 to 1984 show that the Atlantic provinces' share of the Canadian total rose by less than two percentage points between 1968 and 1984, going from 3.8% to 5.4%. Individually each of the four Atlantic provinces stayed within a half percentage point of each other over this period. Moreover, the relative gain vis-à-vis the rest of the country was greatest up to the mid-1970s and since then there has been little or no advance. (Table A2.24.)

The breakdown of computers by rental class for 1984 (Table A2.25) shows the Atlantic situation is dominated by smaller size machines, as is the country as a whole. Relatively, however, the size distribution in all the Atlantic provinces except New Brunswick is skewed downward more than in the country as a whole, although the national figures at the upper end are clearly influenced by Ontario and Quebec.

A sectoral breakdown of computer installations for each of the Atlantic provinces and Ontario for the years 1978-1984 shows service industries are clearly the most significant users, with resource industries and manufacturing and construction representing, relatively, a quite small share of the total. Within the service sector, government is clearly the biggest sector, with utilities, communication and transportation among the next largest. Relatively, manufacturing is more important in Ontario, although relatively again, that importance has declined over the period shown.

None of the preceding discussion includes micro-computers. This may not only explain some of the changes by size categories but also some of the trends by industrial sector. While most institutions with computing needs sufficient to support mini-computers or mainframe computers have adopted micros in addition to, rather than in place of, these larger machines, many business users of computers have micros as their only machine(s), i.e., an eventual purchase of a larger machine is put off or eliminated through acquisition of a micro. This might be expected to be the case, for example, amongst independent retailers (whose share of computer installations has fallen as a percentage of the total for all provinces except P.E.I., for the period 1978-1984.)

It is also important to emphasize that raw data on computer installations do not indicate anything of the networking of those computers or the ownership. Machines installed in Atlantic Canada that are part of the operation of a national company may have quite different functions than ones owned and operated by a local company.

The Atlantic provinces share of the Canadian total for microcomputers (5.6%) is almost exactly in line with its share of larger computer installations (5.4%). (Table A2.24 and A2.27.)

Regarding establishments primarily engaged in providing computer services for Canada and the Atlantic provinces, the Atlantic provinces are significantly under-represented relative to the national totals. (Table A2.28.) This is significant not only insofar as it indicates a very small nucleus of existing activity on which to build, but also because the figures include firms that provide maintenance and repair services and other support services for computer users. The relative lack of such support services in Atlantic Canada could seriously influence efforts to increase the number of computer installations in Atlantic Canada.

CATV

Community antenna television networks (cable television) represent a potential carrier alternative for a number of enhanced telecommunications services and are therefore of interest to this study.

Data on household penetration rates for cable television in Canada and the Atlantic provinces, (Table A2.29), show that all four Atlantic provinces have penetration rates well below the Canadian average, a finding which is at least partially explained by the lower level of urbanization in the Atlantic provinces. Cable TV developed first in urban centres in Canada.

It is also noteworthy that only household figures are shown. Cable has been almost exclusively a residential phenomenon, as it has been developed and used to this point to deliver television broadcasts. Cable companies have achieved little or no penetration of the business market because there has been little or no demand for augmented television service in business locations. As a potential competitor for the telephone common carriers in delivering the new services of the information age, the existing lack of penetration of business establishments and the fact that most business offices have not been wired for cable place cable operators at a distinct disadvantage. The competitive position of cable is discussed more fully in the next chapter.

Conclusion

This chapter has outlined the provincial economies of the Atlantic region; the telecommunications sector; and, very briefly, some aspects of the status of computers and of cable television in the Atlantic provinces. We turn now to a discussion of the theoretical framework for assessing the impact of telecommunications on the Atlantic region, following which the theoretical framework will be used to offer an interpretation of the data which have been set out here.

Statistical Annex

Table A2.1
Population by Age and Sex
Atlantic Provinces, 1983
(000's)

	Canada	NFLD.	P.E.I.	N.S.	N.B.
Total - both sexes	25127.9	579.5	125.3	869.9	713.3
0 - 9	3621.5	98.8	19.4	123.3	108.2
10 - 19	3890.0	120.9	21.8	145.9	125.7
20 - 29	4716.6	104.2	21.9	161.0	130.8
30 - 39	4017.3	88.7	18.5	133.4	110.0
40 - 49	2775.2	55.0	12.3	90.6	71.1
50 - 59	2448.0	44.1	10.6	78.1	61.4
60 - 69	1961.8	37.2	10.0	71.6	54.7
70 +	1698.2	30.6	10.9	65.8	50.9
Total - Female	12694.4	288.7	62.9	439.4	359.3
0 - 9	1764.4	48.3	9.5	60.3	52.6
10 - 19	1896.0	59.2	10.5	71.0	61.2
20 - 29	2349.6	52.5	10.9	79.6	64.8
30 - 39	2008.7	44.3	9.1	66.7	54.9
40 - 49	1379.7	27.0	6.0	45.0	35.5
50 - 59	1235.8	21.6	5.3	40.0	31.5
60 - 69	1049.5	18.8	5.2	38.1	28.9
70 +	1010.4	17.1	6.2	38.5	29.7
Total - Male	12433.5	290.9	62.4	430.5	354.0
0 - 9	1856.4	50.6	9.9	63.0	55.5
10 - 19	1994.0	61.6	11.3	75.0	64.5
20 - 29	2370.8	51.8	11.0	81.3	65.9
30 - 39	2008.5	44.4	9.3	66.7	55.1
40 - 49	1395.5	28.0	6.2	45.6	36.1
50 - 59	1212.2	22.5	5.4	38.1	30.0
60 - 69	912.3	18.5	4.7	33.6	25.8
70 +	687.9	13.5	4.7	27.4	21.1

Source: Statistics Canada catalogue 91-210 Postcensal Annual Estimates of Population by Marital Status, Age, Sex and Components of Growth for Canada, Provinces and Territories, June 1, 1984 Vol. 2 Second Issue.

Table A2.2
Urban-Rural Population
Canada and Atlantic Provinces
1976, 1981

	Urban			Rural		
	1976	1981	% change	1976	1981	% change
CANADA	17367.0	18435.9	6.2	5625.6	5907.3	5.0
NFLD.	328.3	332.9	1.4	229.5	234.8	2.3
P.E.I.	43.9	44.5	1.4	74.4	78.0	4.8
N.S.	462.6	466.8	.9	366.0	380.6	4.0
N.B.	354.4	353.2	-.3	322.8	343.2	6.3

Source: Statistics Canada

1976 Census of Canada, Population: Geographic Distribution, Urban and Rural Distribution, Catalogue 92-807 February 1978.

1981 Census of Canada, Population: Mother Tongue, Catalogue 92-902 (Volume 1, National Series).

Table A2.3
Population 15 Years and Over by Sex and Level A Schooling Canada and Atlantic Provinces 1981
%

		Population	Less than Grade 9	Grades 9-10	Grades 11-13	Post Secondary Non-University	University	
							with degree	without
CANADA	T	100	20.7	17.7	25.9	19.7	8.0	8.0
	M	100	20.8	17.8	24.1	19.3	9.9	8.2
	F	100	20.6	17.7	27.7	20.1	6.2	7.7
NFLD.	T	100	30.8	24.4	16.4	16.3	4.7	7.4
	M	100	32.9	22.3	15.5	16.4	5.7	7.2
	F	100	28.8	26.4	17.4	16.3	3.6	7.6
P.E.I	T	100	24.1	24.0	17.8	18.1	6.1	9.9
	M	100	29.9	22.7	15.9	16.1	7.3	8.1
	F	100	18.4	25.3	19.8	20.1	4.8	11.7
N.S.	T	100	20.9	23.8	20.9	19.0	7.4	8.0
	M	100	24.0	23.2	19.0	17.6	8.7	7.7
	F	100	18.0	24.5	22.8	20.3	6.1	8.4
N.B.	T	100	28.6	18.6	23.2	16.3	6.0	7.3
	M	100	31.4	17.7	21.0	15.7	7.1	6.9
	F	100	25.9	19.4	25.3	16.8	5.0	7.7

Source: Statistics Canada
1981 Census of Canada

Table A2.4
Labour Force Statistics
Canada and Atlantic Provinces

		Population 15 Years and over	Labour Force (000's)			Not in Labour Force	Participation Rate (percentage)	Unemployment Rate (percentage)	Employment/ Population Ratio
			Total	Employment	Unemployment				
Canada	1980	18,053	11,573	10,708	865	6,480	64.1	7.5	59.3
	1981	18,375	11,904	11,006	898	6,471	64.8	7.5	59.9
	1982	18,664	11,958	10,644	1,314	6,706	64.1	11.0	57.0
	1983	18,917	12,183	10,734	1,448	6,735	64.4	11.9	56.7
	1984	19,148	12,399	11,000	1,399	6,749	64.8	11.3	57.4
NFLD.	1980	389	205	178	27	184	52.7	13.3	45.7
	1981	395	208	179	29	187	52.6	13.9	45.3
	1982	401	209	174	35	192	52.1	16.8	43.3
	1983	411	214	174	40	197	52.1	18.8	42.3
	1984	418	221	176	45	197	52.9	20.5	42.1
P.E.I.	1980	89	53	47	6	36	59.9	10.6	52.9
	1981	90	53	47	6	37	58.7	11.2	52.2
	1982	90	52	45	7	38	57.8	12.9	50.3
	1983	91	55	48	7	36	60.2	12.2	52.8
	1984	93	56	49	7	37	60.2	12.8	52.5

Table A2.4 (continued)

		Population 15 Years and over	Labour Force (000's)			Not in Labour Force	Participation Rate (percentage)	Unemployment Rate (percentage)	Employment/ Population Ratio
			Total	Employment	Unemployment				
N.S.	1980	619	356	321	35	264	57.4	9.7	51.9
	1981	626	359	322	36	267	57.3	10.2	51.4
	1982	633	361	313	47	273	57.0	13.2	49.5
	1983	642	369	320	49	273	57.4	13.2	49.8
	1984	653	387	337	51	266	59.3	13.1	51.6
N.B.	1980	504	280	249	31	224	55.6	11.0	49.5
	1981	508	286	253	33	223	56.2	11.5	49.7
	1982	514	282	243	40	231	55.0	14.0	47.2
	1983	522	290	247	43	232	55.5	14.8	47.2
	1984	529	291	248	44	238	55.1	14.9	46.9

Notes: (1) figures given are based on annual averages
(2) labour force data is unadjusted for seasonal variation

Source: Statistics Canada, catalogue 71-201

Table A2.5
Labour Force 15 Years and Over by Sex and Selected Occupations
Canada and Atlantic Provinces 1981

	Total	Percentage Distribution	Male	Percentage Distribution	Female	Percentage Distribution
CANADA						
All Occupations	11,994,960	100.0	7,145,690	100.0	4,849,265	100.0
Clerical & Related Occupations	2,189,665	18.3	487,945	6.8	1,701,740	35.1
Construction	768,880	6.4	753,555	10.5	15,335	0.3
Managerial, Administrative & Related Occupations	813,700	6.8	611,515	8.6	202,180	4.2
Product Fabricating, Assembling & Repairing	929,940	7.8	703,260	9.8	226,700	4.7
Sales	1,145,555	9.6	678,505	9.5	467,035	9.6
Service	1,430,105	11.9	682,480	9.6	747,640	15.4
All other occupations	4,717,115	39.3	3,228,430	45.2	1,488,635	30.7
NFLD.						
All Occupations	222,475	100.0	141,480	100.0	80,985	100.0
Clerical & Related Occupations	32,120	14.4	7,900	5.6	24,225	29.9
Construction	19,765	8.9	19,475	13.8	295	0.4
Managerial, Administrative & Related Occupations	11,050	5.0	8,645	6.1	2,400	3.0
Product Fabricating, Assembling & Repairing	9,475	4.3	9,015	6.4	455	0.6
Sales	19,280	8.7	10,650	7.5	8,635	10.7
Service	24,380	11.0	10,645	7.5	13,730	17.0
All other occupations	106,405	47.8	75,150	53.1	31,245	38.6

Table A2.5 (continued)

	Total	Percentage Distribution	Male	Percentage Distribution	Female	Percentage Distribution
P.E.I.						
All Occupations	56,555	100.0	33,705	100.0	22,845	100.0
Clerical & Related Occupations	7,330	13.0	1,505	4.5	5,830	25.5
Construction	4,590	8.1	4,500	13.4	95	0.4
Managerial, Administrative & Related Occupations	2,905	5.1	2,235	6.6	675	3.0
Product Fabricating, Assembling & Repairing	2,170	3.8	1,935	5.7	240	1.1
Sales	4,580	8.1	2,415	7.2	2,160	9.5
Service	7,570	13.4	2,785	8.3	4,775	20.9
All other occupations	27,410	48.5	18,330	54.4	9,070	39.7
N.S.						
All Occupations	378,425	100.0	231,480	100.0	146,945	100.0
Clerical & Related Occupations	60,310	15.9	13,015	5.6	47,295	32.2
Construction	28,160	7.4	27,700	12.0	465	0.3
Managerial, Administrative & Related Occupations	20,900	5.5	15,675	6.8	5,240	3.6
Product Fabricating, Assembling & Repairing	22,260	5.9	19,690	8.5	2,565	1.7
Sales	37,540	9.9	21,585	9.3	15,945	10.9
Service	54,165	14.3	28,045	12.1	26,120	17.8
All other occupations	155,090	41.0	105,770	45.7	49,315	33.6

Table A2.5 (continued)

	Total	Percentage Distribution	Male	Percentage Distribution	Female	Percentage Distribution
N.B.						
All Occupations	298,010	100.0	182,670	100.0	115,345	100.0
Clerical & Related Occupations	48,100	16.1	10,610	5.8	37,490	32.8
Construction	24,505	8.2	24,190	13.2	310	0.3
Managerial, Administrative & Related Occupations	16,590	5.6	12,890	7.1	3,705	3.2
Product Fabricating, Assembling & Repairing	16,765	5.6	15,080	8.3	1,695	1.5
Sales	27,270	9.2	16,355	9.0	10,910	9.5
Service	40,010	13.4	18,405	10.1	21,610	18.9
All other occupations	124,770	41.9	85,140	46.6	39,625	34.7

Source: Statistics Canada 1981 Census of Canada, Unpublished Tables, Series no. (CTE81B33)

Table A2.6
Estimates of Employees by Industry (Non-Agriculture) Canada and Atlantic Provinces 1984
(ooo's)

	Canada	Percentage Distribution	NFLD.	Percentage Distribution	PEI.	Percentage Distribution	NS.	Percentage Distribution	NB.	Perrcentage Distribution
Non-Agricultural Industries - Total	8694.66	100.0	125.28	100.0	29.66	100.0	250.13	100.0	186.28	100.0
Forestry	57.16	.7	1.99	1.6	–	–	2.06	.8	4.75	2.5
Mining	148.90	1.7	3.74	3.0	–	–	4.80	1.9	2.96	1.6
Manufacturing	1672.43	1.9	14.70	11.7	2.88	9.7	35.52	14.2	28.58	15.3
Construction	355.24	4.1	4.39	3.5	–	–	10.65	4.3	6.63	3.6
Transportation, Communications and Other Utilities	796.67	9.2	14.44	11.5	3.23	10.9	23.77	9.5	22.16	11.9
Trade - Commerce	1556.13	17.9	21.48	17.1	5.38	18.1	44.94	18.0	34.14	18.3
Finance, Insurance and Real Estate	536.31	6.2	4.63	3.7	–	–	12.83	5.1	8.23	4.4
Community, Business and Personal Services	2914.86	33.5	43.43	34.7	10.63	35.8	87.86	35.1	59.92	3.2
Public Administration and Defence	657.0	7.6	16.54	13.2	–	–	27.65	11.1	18.93	10.2
Goods Producing Industries	2233.72	25.7	24.77	19.8	4.53	15.3	53.05	21.2	42.93	23.1
Service Producing Industries	6460.95	74.3	100.52	80.2	25.16	84.8	197.08	78.8	143.39	77.0

Source: Statistics Canada, Catalogue 72-002 Monthly, 'Employment, Earnings and Hours'.

Table A2.7
Professionals by Sub-Occupation
Canada and Atlantic Provinces
1981

	CANADA	NFLD.	P.E.I.	N.S.	N.B.
Accountants	9,481	122	24	170	156
Dentists	7,553	104	21	205	137
Doctors	29,633	465	117	933	593
Engineers and Architects	3,606	18	*	28	13
Lawyers	14,925	248	50	417	317
Other Professionals	38,655	571	92	914	577

Notes: * indicates fewer than five persons. 'Professionals' refers to self-employed individuals with professional fees as their principal source of income.

Source: Unpublished data by Revenue Canada Taxation (released to Statistics Canada in Market Research Handbook 1984)

Table A2.8
Provincial Gross Domestic Product
1964, 1974, 1982
Atlantic Provinces

	1964	1974	1982	1983
	millions of dollars			
NEWFOUNDLAND	651	1906	4945	5444
P.E.I.	142	396	1039	1198
NOVA SCOTIA	1260	3504	8394	9428
NEW BRUNSWICK	985	2817	6383	7348

Source: Statistics Canada Catalogue 13-213 'Provincial Economic Accounts Experimental Data' 1961-76 and 1968-1983.

Table A2.9
Per Capita Personal Disposable Income
1973, 1980, 1982, 1983
Canada and Atlantic Provinces

	1973	1980	1982	1983
	dollars			
CANADA	3,617	8,328	10,364	10,852
NEWFOUNDLAND	2,441	5,472	7,197	7,700
P.E.I.	2,719	6,129	7,642	8,661
NOVA SCOTIA	2,934	6,624	8,362	8,990
NEW BRUNSWICK	2,750	6,089	7,661	8,314

Source: Statistics Canada, catalogue 13-201 'National Income and Expenditure Accounts 1969-1983' Tables 37 and Table A.

Table A2.10
Wages and Salaries
Canada and Atlantic Provinces
1976-1984
(1976 = 100)

	1976	1977	1978	1979	1980	1981	1982	1983	1984
					(millions of $)				
Canada	100,348	110,379	120,030	135,274	153,671	176,568	189,161	198,634	209,514
Index	100.0	110.0	119.6	134.8	153.1	176.0	188.5	197.9	208.8
Newfoundland	1,529	1,636	1,713	1,961	2,120	2,470	2,673	2,741	2,888
Index	100.0	107.0	112.1	128.3	138.7	161.5	174.8	179.3	188.8
P.E.I.	280	310	338	383	435	480	533	591	614
Index	100.0	110.7	120.7	136.8	155.4	171.4	190.4	211.1	219.3
Nova Scotia	2,608	2,844	3,141	3,572	3,975	4,452	4,816	5,178	5,611
Index	100.0	109.1	120.4	137.0	152.4	170.7	184.7	198.5	215.1
New Brunswick	2,106	2,266	2,482	2,861	3,041	3,377	3,600	3,889	4,170
Index	100.0	107.6	117.8	135.8	144.4	160.4	170.9	184.7	198.0

Source: Statistics Canada Catalogue 72-005 Quarterly 'Estimates of Labour Income'.

Table A2.11
Number and Average Income of Private Households
1981
Canada and Atlantic Provinces

	Total Private Households		Total Family Households		Total one-family Households	
	Number	Average Income	Number	Average Income	Number	Average Income
CANADA	8,281,530	24,460	6,231,485	27,736	6,140,335	27,588
NEWFOUNDLAND	148,420	21,198	130,140	22,468	125,285	22,148
P.E.I.	37,660	19,338	29,760	21,609	29,310	21,468
NOVA SCOTIA	273,195	20,476	212,235	22,929	208,330	22,766
NEW BRUNSWICK	214,920	20,112	173,395	22,172	170,275	22,022

Source: Statistics Canada Catalogue 92-904, 1981 Census of Canada, Private Households.

Table A2.12
Percentage Distribution of Families by Income Groups
Canada and Atlantic Provinces
1982

INCOME GROUP	CANADA	NFLD.	P.E.I.	N.S.	N.B.
Total	100.0	100.0	100.0	100.0	100.0
Under $5,000	1.6	1.6	1.2	1.9	1.6
$ 5,000 - 9,999	5.9	9.2	8.7	7.3	10.2
$10,000 - 12,999	6.3	8.5	10.6	9.7	10.3
$13,000 - 14,999	4.5	5.7	5.8	6.4	5.9
$15,000 - 16,999	4.1	6.4	5.3	5.7	5.3
$17,000 - 19,999	5.8	7.7	10.8	7.3	7.5
$20,000 - 24,999	10.9	11.4	14.5	15.2	12.5
$25,000 - 34,999	22.0	21.9	21.9	21.9	19.9
$35,000 - 44,999	17.1	14.4	10.4	11.8	14.0
$45,000 - Over	21.6	13.0	10.7	12.8	12.7
Average Income ($)	32,981	27,522	25,789	27,356	26,764
Median Income ($)	29,731	24,707	22,739	23,822	23,559

Source: Statistics Canada Catalogue 13-207, Annual 'Income Distributions by Size in Canada'.

Table A2.13
Telephones per 100 Population
Atlantic Provinces and Canada
1975-1984*

	Canada		Newfoundland		Prince Edward Island		Nova Scotia		New Brunswick	
	total telephones '000	number of telephones per 100 population	total telephones '000	number of telephones per 100 population	total telephones '000	number of telephones per 100 population	total telephones '000	number of telephones per 100 population	total telephones '000	number of telephones per 100 population
1975	13,165	57.2	200	36.1	49	41.0	394	47.5	321	46.9
1976	13,885	59.6	212	37.9	52	42.9	416	49.8	322	47.8
1977	14,488	61.8	221	39.1	55	45.4	432	51.5	343	49.6
1978	15,172	64.3	232	40.6	59	48.6	453	53.5	359	51.3
1979	15,839	66.5	253	43.8	64	51.5	475	55.9	377	53.4
1980	16,531	68.6	259	44.3	67	54.1	499	58.3	390	54.9
1981	16,944	69.6	265	45.1	70	55.8	520	60.5	402	56.4
1982	16,802	67.9	268	46.6	73	58.9	533	62.2	411	58.2
1983	16,630	66.5	276	47.7	75	60.4	550	63.6	423	59.5
1984	16,480	65.2	283	48.9	78	61.5	571	65.0	439	61.3

Source: Statistics Canada Catalogue 56-203 'Telephone Statistics'.

Note: 1984 data obtained prior to publication and subject to change.
*1984 data 'total telephone' columns must be used with caution. Due to market and regulatory changes, telephone companies now report 'access lines' which will not correspond to actual telephone sets.

Table A2.14
Telephones* by Type of Service - Canada and Atlantic Provinces
1975-1984

	Individual		2-Party		4-Party		More than 4-Party							Extension		Total
	Res	Bus	Res	Bus	Res	Bus	Res	Bus	WATS	Coin	Mobile	Centrex	PBX	Res	Bus	Tele-phones
NFLD.																
1975	88,985	17,233	22,808	1,421	4,987	184	1,110	68	-	1,716	320	181	19,140	25,179	16,540	199,872
1976	92,973	17,762	23,605	1,041	4,592	170	984	70		1,848	470	3,688	18,369	28,889	17,064	211,525
1977	98,805	18,966	24,570	1,009	2,962	92	602	36	-	1,995	473	4,864	18,010	32,127	16,072	220,583
1978	108,470	19,715	21,380	877	1,644	55	393	19		2,145		6,785	16,830	37,446	16,584	232,343
1979	122,114	21,751	15,660	731	941	40	154	13	-	2,267	-	8,265	17,466	45,919	17,321	252,642
1980	126,287	22,251	12,594	623	666	10	110	12	-	2,291	751	10,548	15,878	46,870	19,726	258,617
1981	130,072	22,819	11,548	628	431	20	108	12	-	2,361	730	11,758	14,019	49,943	20,987	265,436
1982	134,529	22,906	9,634	584	333	19	77	11	-	2,419	844	12,846	17,112	48,882	18,041	268,237
1983	140,179	22,405	7,982	513	291	25	73	8	-	2,474	920	13,088	14,621	52,446	21,187	276,212
1984	144,588	24,154	6,949	499	231	21	36	5	169	2,458	999	7,460	3,180	† 190,755		282,825
P.E.I.																
1975	18,017	4,598	231	3	1,619	304	10,000	91	-	301	42	-	4,005	6,411	3,534	49,156
1976	19,025	4,802	205	4	1,587	90	10,480	312		347	63		4,312	7,373	3,725	52,325
1977	20,425	5,083	182	2	1,290	75	10,646	302	-	363	54	-	4,551	8,326	3,997	55,296
1978	21,990	5,443	160	1	1,203	65	10,945	285		380	64		4,860	9,726	4,314	59,436
1979	23,391	3,448	144		1,100	59	11,264	217	-	428	82		4,966	11,588	7,070	63,757
1980	24,744	3,668	127		1,108	60	11,016	201		459	95		5,119	13,000	7,543	67,140
1981	25,494	6,308	114		5,179	120	7,045	119	-	487	87	-	5,559	14,061	5,154	69,727
1982	26,301	6,233	102		5,250	111	7,001	122		525	88	1,221	5,182	15,574	5,133	72,843
1983	27,352	6,410	91	-	7,648	148	4,554	105	-	544	85	1,821	5,255	16,208	5,028	75,249
1984	28,531	3,877	85	2	12,283	243	-	-	36	578		2,175	2,761	† 50,671		78,029

Table A2.14 (continued)

	Individual		2-Party		4-Party		More than 4-Party							Extension		Total
	Res	Bus	Res	Bus	Res	Bus	Res	Bus	WATS	Coin	Mobile	Centrex	PBX	Res	Bus	Tele-phones
N.S.																
1975	179,839	33,923	2,446	186	9,[illegible]87	452	33,726	936	1	3,477	266	9,436	29,637	61,134	29,173	394,219
1976	191,317	35,612	2,209	183	9,112	409	34,956	934	1	3,474	355	9,506	29,415	67,009	31,752	416,244
1977	198,394	37,380	1,843	177	8,113	369	35,442	958	1	3,458	391	8,934	31,280	72,476	33,123	432,339
1978	207,354	38,981	1,737	177	7,378	342	35,478	985	1	3,656	389	8,857	31,960	79,464	35,871	452,630
1979	216,168	41,130	1,419	177	8,677	363	33,415	953	1	3,810	466	8,648	33,126	88,784	38,171	475,308
1980	223,481	43,860	1,207	173	16,749	562	24,402	773	1	3,974	477	8 715	34,743	99,271	40,853	499,241
1981	229,664	46,068	1,109	169	23,639	715	18,267	587	1	4,107	452	8,825	36,367	107,703	42,626	520,299
1982	234,162	46,375	1,047	167	41,157	1,257	40	1		4,123	480	9,327	36,350	114,854	43,496	532,836
1983	242,535	48,762	968	170	40,475	1,229	40		848	4,249	490	9,695	38,094	118,853	44,002	550,410
1984	251,907	27,652	1,044	168	40,290	1,247	40		1,177	4,391	-	17,443	25,825	† 371,184		571,088
N.B.																
1975	139,699	24,098	10,190	309	8,896	252	21,471	521	-	2,084	177	7,201	22,137	53,019	30,657	320,711
1976	144,059	25,583	9,025	279	10,576	329	21,177	539		1,966	216	9,557	21,990	55,957	30,585	331,838
1977	149,795	26,674	7,881	253	11,412	331	20,436	503		2,042	205	9,975	22,224	59,268	31,921	342,920
1978	156,122	28,652	7,019	236	13,625	417	18,724	462	-	2,115	206	10,964	22,694	64,580	33,026	358,842
1979	162,028	29,937	6,074	223	15,824	495	17,083	395	-	2,301	217	12,583	23,191	72,074	34,089	376,514
1980	165,954	30,764	5,620	202	16,795	544	16,635	377	-	2,434	254	15,678	24,287	77,521	32,401	389,466
1981	171,570	43,235	5,145	190	22,995	682	10,215	242	51	2,887	363	9,724	27,991	81,685	25,107	402,082
1982	176,202	50,009	4,767	158	26,768	757	6,675	141	83	3,062	367	9,047	23,229	85,911	24,017	411,193
1983	181,325	51,198	4,914	159	27,537	772	6,861	148	79	3,132	374	9,259	23,772	88,422	24,578	422,530
1984	188,415	78,034	3,743	125	32,434	881	1,054	35	-	3,469	3,171	1,217	1,511	† 314,109		439,446

Table A2.14 (continued)

	Individual		2-Party		4-Party		More than 4-Party							Extension		Total Tele-phones
	Res	Bus	Res	Bus	Res	Bus	Res	Bus	WATS	Coin	Mobile	Centrex	PBX	Res	Bus	
CAN.																
1975	5,769,742	1,086,725	590,189	8,384	122,501	5,546	559,893	20,146	6,750	89,431	18,488	409,511	1,378,472	2,194,210	904,922	13,165,010
1976	6,052,752	1,148,650	556,922	7,663	138,134	6,218	560,424	20,559	7,975	92,663	21,838	446,038	1,416,383	2,450,174	958,662	13,885,055
1977	6,324,122	1,208,711	522,746	7,370	168,799	7,489	531,133	19,562	9,174	97,674	23,185	476,337	1,456,709	2,632,349	1,002,421	14,487,781
1978	6,626,576	1,277,360	489,664	6,882	245,380	9,886	452,894	17,158	11,007	102,564	31,752	500,457	1,511,275	2,829,060	1,059,658	15,171,573
1979	6,903,348	1,350,786	451,109	6,391	276,032	12,434	417,348	17,206	13,206	107,878	39,149	528,368	1,556,026	3,030,051	1,129,622	15,838,954
1980	7,235,049	1,428,413	432,767	5,733	344,272	12,827	326,091	13,289	14,623	115,092	50,446	549,418	1,664,655	3,170,880	1,167,136	16,530,691
1981	7,510,999	1,496,662	422,866	5,233	409,478	14,373	231,417	10,553	15,756	123,892	53,330	558,321	1,730,961	3,175,854	1,184,043	16,943,738
1982	7,635,134	1,492,627	409,465	5,068	362,832	14,693	205,517	9,494	15,245	133,155	52,203	542,228	1,665,018	3,145,435	1,114,304	16,802,427
1983	7,836,186	1,479,236	385,449	4,441	417,304	14,136	199,693	8,823	17,145	140,094	50,465	517,898	1,556,933	2,907,148	1,095,627	16,630,578
1984	8,095,581	1,733,551	355,228	4,018	475,513	15,964	136,841	6,873	62,829	144,039	73,824	365,413	351,344	† 11,827,271		16,479,591

*Except 1984 which counts 'access lines' in place of telephones.

Source: Statistics Canada Catalogue 56-203 Telephone Statistics.

Note: † 1984 information on extension phones is unavailable. In its place is reported 'total access lines' for 1984.

1984 data obtained prior to publication and subject to change. Newfoundland data includes both Newfoundland Telephone and Terra Nova Telephone. Virtually all Newfoundland Telephone line service is "individual" by 1983/84 (99.7%).

1983 figures for N.B. for "more than 4-party" are, according to NBTel, overstated. The discrepancy presumably arises from a delay in identifying the timing of certain changes by Statistics Canada. For 2-party and 4-party service it should also be noted that in the case of all carriers the line-fill is typically well below the technical maximum. For example, for MT&T, the line-fill on 4-party service has been in the range of 2.7 or lower over the period shown.

Table A2.15
Residence and Business Telephones*
Atlantic Provinces and Canada
1975-1984

	Canada		Newfoundland		Prince Edward Island		Nova Scotia		New Brunswick	
	Residence	Business	Residence	Business	Residence	Business	Residence	Business	Residence	Business
1975	9,236,635	3,928,375	143,069	56,803	36,278	12,878	286,732	107,487	233,275	87,436
1976	9,758,501	4,126,554	151,043	60,482	38,670	13,655	304,603	111,641	240,794	91,044
1977	10,179,232	4,308,549	159,066	61,517	40,869	14,427	316,268	116,071	248,792	94,128
1978	10,643,666	4,527,907	169,333	63,010	44,024	15,412	331,411	121,219	260,070	98,[illegible]2
1979	11,077,970	4,760,984	184,788	67,854	47,487	16,270	348,463	126,845	273,083	103,431
1980	11,509,116	5,021,575	186,527	72,090	49,995	17,145	365,110	134,131	282,525	106,941
1981	11,750,672	5,193,066	192,102	73,334	51,893	17,834	380,382	139,917	291,610	110,472
1982	11,758,468	5,043,959	193,455	74,782	54,254	18,589	391,260	141,576	300,323	110,870
1983	11,745,850	4,884,728	200,971	75,241	55,863	19,386	402,871	147,539	309,059	113,471
1984	9,063,183	2,764,088	151,804 (205,986)	38,951	40,903 (57,499)	9,768	293,281 (416,229)	77,903	225,666 (320,179)	88,443

* 1984 data report 'access lines' as reported by the telephone companies while the figures in brackets refer to telephone sets and are based on a sample taken in May 1984.

Source: Statistics Canada 56-203 'Telephone Statistics'. Data for 1984 was obtained prior to publication and is subject to change.
Statistics Canada Catalogue 64-202 'Household Facilities and Equipment'.

Table A2.16
Telephones in Telephone Exchanges with Populations of 25,000 and Over, 1975-1984 Atlantic Provinces*

	Residence	Business	Total for 25,000 population and over	All telephones	Total for less than 25,000 population
NFLD.					
1975	46,840	30,954	77,794	199,872	122,078
1976	45,203	28,280	73,483	211,525	138,042
1977	53,130	33,373	86,503	220,583	134,080
1978	58,337	33,517	91,854	232,343	140,489
1979	78,247	38,157	116,404	252,642	136,238
1980	76,286	39,237	115,523	258,617	143,094
1981	77,888	39,291	117,179	265,436	148,257
1982	78,808	40,984	119,792	268,237	148,445
1983	80,804	42,128	122,932	276,212	153,280
1984	55,364	21,056	76,420	190,755	114,335
P.E.I.					
1975	13,499	7,501	21,000	49,156	28,156
1976	14,346	7,926	22,272	52,325	30,053
1977	14,982	8,354	23,336	55,296	31,960
1978	16,042	8,980	25,022	59,436	34,414
1979	14,784	10,903	25,687	63,757	38,070
1980	15,471	11,559	27,030	67,140	40,110
1981	16,085	11,515	27,600	69,727	42,127
1982	20,732	12,812	33,544	72,843	32,299
1983	21,262	11,323	32,585	75,249	42,664
1984	15,163	6,001	21,164	50,671	29,507

Table A2.16 (continued)

	Residence	Business	Total for 25,000 population and over	All telephones	Total for less than 25,000 population
N.S.					
1975	120,374	64,412	184,786	394,219	209,433
1976	126,752	66,443	193,195	416,244	223,049
1977	141,627	73,167	214,794	432,339	217,545
1978	147,518	76,252	223,770	452,630	228,860
1979	155,321	79,017	234,338	475,308	240,970
1980	162,646	83,373	246,019	499,241	253,222
1981	169,159	87,190	256,349	520,299	263,950
1982	172,034	87,781	259,815	532,836	273,021
1983	175,044	92,182	267,226	550,410	283,184
1984	140,126	44,724	184,850	371,184	186,334
N.B.					
1975	91,751	54,316	146,067	320,711	174,644
1976	93,419	56,157	149,576	331,838	182,262
1977	155,398	64,163	219,561	342,920	123,359
1978	99,874	54,618	154,492	358,842	204,350
1979	104,861	56,902	161,763	376,514	214,751
1980	107,662	60,192	167,854	389,466	221,162
1981	109,713	48,564	158,277	402,082	243,805
1982	114,862	49,846	161,332	411,193	249,861
1983	112,885	54,254	167,139	422,530	255,391
1984	81,354	42,566	123,920	314,109	190,189

* 1984 data reports 'access lines' instead of 'telephone'.

Notes: (1) "All telephones" from Table 2.16 (2) "Total for less than 25,000" is a residual figure

Source: Statistics Canada Catalogue 56-203 Telephone Statistics. Data for 1984 was released prior to publication and is subject to change.

Table A2.17
Operating Revenue of the Telephone Industry Atlantic Provinces, 1984

		NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
	Operating revenue				
	Local service revenue:				
	Charges to Customers:				
1	Monthly revenue for service & equipment	53,138	11,729	96,118	72,505
2	Message charges revenue	-	9	98	477
3	Non-recurring charges revenue	1,663	553	4,743	3,302
4	Coin telephones - Local service	1,312	288	1,988	2,081
5	Telephone	-	746	3,637	3,703
6	Teletypewriter	-	-	-	-
7	Program transmission	-	28	279	645
8	Other local private line service revenue	-	91	976	660
9	Other local service	-	8	78	115
10	**Total**	**56,113**	**13,452**	**107,917**	**83,488**
	Toll service revenue:				
	Message toll revenue:				
11	Telephone	89,371	15,327	122,748	99,383
12	Teletypewriter	1,677	45	911	188
13	Other message toll revenue	114	-	-	697
14	Wide area telephone service (WATS)	2,496	999	22,114	15,911

Table A2.17 (continued)

		NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
	Toll private line service revenue:				
15	Telephone	-	367	3,316	1,960
16	Teletypewriter	-	12	44	154
17	Program transmission	-	78	1,070	1,852
18	Wide band	-	-	-	2,169
19	Other toll private line service revenue	315	538	9,976	6,985
20	Other toll service revenue	-	12	31	37
21	Less charges payable to connecting systems for toll services	802	1,420	4,294	-
22	**Total**	**93,171**	**15,958**	**155,916**	**129,336**
	Miscellaneous operating revenue:				
23	Directory advertising and sales	3,243	815	7,804	7,873
24	Plant and building rental	1,876	175	2,218	2,748
25	Other	11,079	270	3,097	7,128
26	**Total**	**16,198**	**1,261**	**13,119**	**17,749**
27	Less uncollectible operating revenue	249	137	1,175	675
28	**TOTAL OPERATING REVENUE**	**165,233**	**30,543**	**275,777**	**229,898**

Table A2.18
Operating Expenses of the Telephone Industry, Atlantic Provinces, 1984

	NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
Operating Expenses				
Maintenance:				
1 Buildings and grounds	729	110	1,043	761
2 Structures other than buildings (outside plant)	14,603	908	6,363	3,534
3 Machinery and equipment (including central office equipment and station equipment)	10,015	3,986	29,082	17,838
4 Other	4,967	962	6,216	5,451
5 **Total**	**30,314**	**5,966**	**42,704**	**27,584**
6 Depreciation	29,741	5,635	46,293	40,579
Traffic:				
7 Operators' wages	3,596	1,043	6,368	5,491
8 Other	1,988	521	6,235	1,151
9 **Total**	**5,584**	**1,564**	**12,603**	**6,642**
Marketing and commercial:				
10 General administration	-	545	792	2,294
11 Local commercial operations	2,240	1,021	5,449	3,214
12 Directory expenses	-	400	4,023	4,290

Table A2.18 (continued)

		NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
13	Advertising	-	257	1,501	1,135
14	Sales expenses	2,503	483	4,780	5,031
15	Miscellaneous	1,135	12	827	4,164
16	**Total**	**5,878**	**2,718**	**17,372**	**20,128**
	Other operating expenses (excluding taxes):				
17	General office expenses	4,780	1,369	30,534	31,312
	Rents:				
18	Land and buildings	350	2	3,340	1,652
19	Machinery and equipment (including curcuits and transmission equipment)	4,664	150	2,413	781
20	Miscellaneous operating expenses (net)	22,195	1,930	19,818	17,416
21	**Total**	31,989	3,451	56,105	51,161
22	**TOTAL OPERATING EXPENSES**	**103,506**	**19,334**	**175,077**	**146,094**

Source: Statistics Canada Catalogue 56-203 'Telephone Statistics'
1984 data obtained prior to publication and is subjerct to change.

Table A2.19

Telephone Plant (at Cost) of the Telephone Industry, Atlantic Provinces, 1984

		NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
1	Land	3,638	247	4,537	3,746
2	Buildings	68,735	6,598	54,817	47,071
	Structures other than buildings (outside plant):				
3	Pole lines	47,417	2,237	34,176	39,172
4	Aerial cable	57,172	12,449	128,133	105,385
5	Underground cable	10,866	1,016	18,573	13,770
6	Buried cable (less duct)	6,851	13,914	40,298	9,038
7	Submarine cable	156	15	799	594
8	Aerial wire	655	137	2,167	2,580
9	Underground conduit	8,663	822	14,762	12,304
10	Sub-total	131,780	30,590	238,908	182,843
	Machinery and equipment:				
	Central office equipment:				
11	Manual	897	1,246	4,362	2,058
12	Step by step	124,380	5,842	36,837	31,573
13	Crossbar	19,114	6,590	86,231	45,747
14	Circuit	38,116	9,966	88,173	80,942
15	Radio	25,304	1,509	36,465	39,608
16	Electronic and Digital	34,109	10,536	69,335	50,494
17	Sub-total	241,920	35,689	321,403	250,422

Table A2.19 (continued)

		NFLD. $'000	P.E.I. $'000	N.S. $'000	N.B. $'000
	Station equipment:				
18	Station apparatus	34,112	9,280	80,341	60,372
19	Station connections	22,631	6,871	41,418	31,193
20	Miscellaneous	8,363	3,072	21,755	14,283
21	Sub-total	65,106	19,223	143,514	105,848
	General equipment:				
22	Furniture and office equipment	6,360	673	22,901	1,110
23	Vehicle and other work equipment	5,849	1,556	14,356	11,960
24	Sub-total	12,209	2,229	37,257	13,070
25	Other machinery and equipment	Dr. 2,173	595	3	13,597
26	Sub-total telephone plant in service	521,215	95,171	800,439	616,597
27	Plant under construction	10,500	987	26,825	10,974
28	Other telephone plant	-	3	8,320	14,791
29	Total telephone plant at December 31	531,715	96,161	835,584	642,362

Source: Statistics Canada Catalogue 56-203
1984 data obtained prior to publication and is subject to change.

Note: NBTel, in its own records, shows "furniture and office equipment" for 1984 as $14,707,000. This is the sum of the amount shown by Statistics Canada of $1,110,000 *plus* the amount of $13,597,000 shown by Statistics Canada as "other machinery and equipment".

Table A2.20
Major Carrier Service Offerings Currently Available

Local Telephone Service (Exchange Service)	
Message Toll Service	
Voicecom I	
Voicecom II	
Outwats	Wide Area Telephone Service
Zonephone In and Out	
800 Service (inwats)	
X-Border 800 Service	
Mass Calling Service (900 service)	
Conference 100	
Conference 400	
Conference 600	
Public Mobile Telephone Service	
Private Mobile Radio Service	
Radio Paging Service	
Network Extension Telephone Service	
Commercial Leased Private Line Voice	
Program Distribution Service	
Broadcast Distribution Services	
Envoy 100	
Envoy Post	
Dataroute	

Table A2.20 (continued)

Datapac
Datalink
Private Automatic Branch Exchange
Teletex
iNet
Centrex
Omnidata
Message Exchange
Private Line Teletype
Telpak Service
Call Completion Service
TWX (Telex)
Multicom I
Multicom II
Offshore Communications
EOS (Electronic Office Services)
Infotex
Infoswitch
Infodat

Table A2.21
Classification of Computer-Communications Service Offerings

Information Retrieval	Transactions	Messaging	Computing	Monitoring
public data bases	banking applications	electronic bulletin boards	remote work stations	energy management
company files	shopping applications	electronic mail	financial management	alarm systems
directories	parts ordering	market research	inventory/stock control	health and safety monitoring
education courses	travel reservations	conferencing	information storage	meter reading
emergency information	brokerage services	"hot lines"	data transfers	remote control of business/household functions

Table A2.22
Future Service Offerings

- Enhanced 800 Service
- Person Locator Service
- Automatic Call Back/Ring Back
- Automated Calling Card Service
- Billed Number Screening
- Check-In Service
- Call Management Services
- Remote Call Forwarding
- Delayed Voice Message Service
- Alarm Reporting
- Electronic Banking
- Credit Card Verifications
- Electronic Directory
- Home Entertainment (games, etc.)
- Home Computing
- Remote Word Processing
- Remote Filing System
- Videotex

Note: The time frame for implementing various of these services may differ between companies. The list, moreover, is illustrative, not exhaustive, for reasons of confidentiality on the part of the carriers, who are reluctant to divulge detailed plans for future service offerings where there is a potential for competitive services to arise.

Table A2.23
Switching Exchange Types - 1984
Percentage Distribution
By Number of Installed Lines

Company Type of Equipment	MT&T	NBTel	Island Tel	Nfld. Tel	T.N.T (1983)
Rurax					40.3
Step	31.8	57.0	46.0	39.0	21.7
Crossbar	44.2	34.0	30.0	31.0	27.9
Electronic	13.8	4.5	13.0	16.0	
Digital	10.2	4.5	11.0	14.0	10.1

Note: The % share of digital would be slightly higher for some companies if digital remotes were counted as central offices.

Table A2.24
Computer Installations in Canada
Historical Record
Canadian Province or Territory

	Alta.	BC	Man.	NB	Nfld.	NS	Ont.	PEI	Que.	Sask.	NWT	Yukon	TOTAL
Dec. 1984	1,467	1,602	522	252	124	320	5,887	33	2,480	896	15	9	13,607*
Dec. 1983	1,664	1,963	578	258	201	398	7,819	32	2,742	962	16	10	16,643
Dec. 1982	1,573	1,806	522	231	183	357	7,226	30	2,566	636	16	8	15,154
Dec. 1981	1,400	1,481	455	190	179	308	6,298	24	2,675	402	15	7	13,434
Dec. 1980	1,084	1,200	396	169	124	276	4,760	12	2,037	320	10	7	10,395
May 1979	774	942	363	146	107	231	3,916	10	1,860	233	9	7	8,598*
May 1978	794	896	333	137	108	199	3,703	11	1,854	204	8	4	8,251*
May 1977	651	731	288	112	95	170	3,123	11	1,456	150	8	4	6,799*
May 1976	555	621	260	97	67	143	2,714	10	1,350	113	5	2	5,937*
May 1975	439	458	200	83	53	126	2,400	7	1,074	94	4	2	4,940*
May 1974	330	331	151	59	44	108	1,894	6	879	92	1	2	3,897*
May 1973	501	499	223	90	56	165	2,809	10	1,271	109	1	2	5,736
May 1972	331	358	179	61	42	120	2,279	5	939	91	1	–	4,406
May 1971	283	290	145	51	31	92	1,814	4	764	73	1	–	3,548
May 1970	213	224	111	40	19	70	1,361	2	603	57	–	–	2,700
May 1969	149	142	85	26	14	43	1,045	1	485	47	–	–	2,037
May 1968	119	107	69	16	9	31	811	–	410	41	–	–	1,613
May 1967	86	93	57	13	6	25	644	–	332	23	–	–	1,279
Jun. 1966	69	70	34	12	6	17	443	–	280	17	–	–	948
Jun. 1965	52	52	30	8	5	14	330	–	204	15	–	–	710
Mar. 1964	–	–	–	–	–	–	–	–	–	–	–	–	502

*Does not include computers that rent for less than $1,000 per month.
Source: Canadian Information Processing Society (CIPS), 'Canadian Computer Census' 1964-84.

Table A2.25
Computer Installations in Canada
Rental Class by Province
(as of Dec. 31, 1984)

	Atla.	B.C.	Man.	N.B.	Nfld.	N.S.	N.W.T.	Ont.	P.E.I.	P.Q.	Sask.	Y.T.	Total
$1,000 to $1,999	422	577	204	78	38	113	3	1,886	19	897	644	2	4,883
$2,000 to $4,999	455	527	138	63	46	104	2	1,706	9	726	145	4	3,925
$5,000 to $9,999	262	255	83	37	24	56	8	979	4	359	59	2	2,128
$10,000 to $19,999	140	119	41	16	10	23	-	554	-	229	23	1	1,156
$20,000 to $49,999	112	70	35	45	2	18	2	372	1	137	17	-	811
$50,000 to $99,999	35	22	12	7	2	4	-	157	-	66	2	-	307
$100,000 and over	25	18	7	2	-	1	-	137	-	47	4	-	241
Other and not identified	16	14	2	4	2	1	-	96	-	19	2	-	156
TOTAL	**1,467**	**1,602**	**522**	**252**	**124**	**320**	**15**	**5,887**	**33**	**2,480**	**896**	**9**	**13,607**

Figures reported for the 1985 census do not include systems valued below $1,000 monthly rental.

Source: CIPS Census

Table A2.26
Computer Installations in Ontario and Atlantic Provinces by Industry (as of Dec. 31)

	New Brunswick							
	1978	1979	1980	1981	1982		1983	1984
Industry								
Primary or Resource (includes agriculture, forestry, fisheries and mining)	2	3	6	10		11	11	14
Construction	4	6	7	7		7	8	9
Manufacturing	18	21	22	23		24	30	33
Transportation	11	11	5	5		30	41	39
Utility	6	6	8	11		15	16	20
Communication (Printing, TV, Radio and newspaper advertising)	4	4	6	7		8	7	9
Distribution (Wholesale, retail)	25	25	32	29		33	30	26
Financial (Banks, trust companies, investment dealers, stock)	9	6	2	2		1	1	–
Insurance			9	8		8	10	10
Other Sevice (Unions, professions and associations)	* 23	28*	5	4		9	11	8
Service Bureau (Computer systems and software companies)	10	10	7	6		7	9	11
Government	23	23	35	37	(49)	48	54	40
Petroleum	1	2	2	2		2	1	1
Educational			14	14		15	18	22
Medical			2	1		2	2	3
Legal			–	–		–	–	–
Accounting			–	–		–	–	1
Hospitality			1	1		1	1	1
Other	1	1	1	2		1	1	5
Industry Class not identified			5	7	(9)	9	7	–
TOTAL	**137**	**146**	**169**	**176**	**(190)**	**231**	**258**	**252**

Table A2.26 (continued)

	Newfoundland					
	1978	1979	1980	1981	1982	1983
Industry						
Primary or Resource (includes agriculture, forestry, fisheries and mining)	8	8	7	5	4	4
Construction	2	2	3	3	2	1
Manufacturing	5	8	12	14	12	10
Transportation	10	10	5	5	6	5
Utility	5	8	7	7	8	7
Communication (Printing, TV, Radio and newspaper advertising)	4	4	4	4	4	4
Distribution (Wholesale, retail)	23	21	21	21	21	23
Financial (Banks, trust companies, investment dealers, stock)	(4	3)	3	2	2	2
Insurance			–	2	2	2
Other Service (Unions, professions and associations)	*22	21*	2	1	1	1
Service Bureau (Computer systems and software companies)	6	7	10	11	13	13
Government	10	12	18	20	(28) 27	31
Petroleum	3	3	3	3	1	1
Educational			20	32	(62) 68	86
Medical			5	5	5	5
Legal			–	–	–	–
Accounting			2	2	2	2
Hospitality			–	–	–	–
Other	3	3	2	–	1	1
Industry Class not identified			–	1	(2) 4	3
TOTAL	**108**	**107**	**124**	**140**	**(179) 183**	**201**

Table A2.26 (continued)

	Nova Scotia						
	1978	1979	1980	1981	1982		1983
Industry							
Primary or Resource (includes agriculture, forestry, fisheries and mining)	9	10	12	12		12	12
Construction	1	1	1	2		2	2
Manufacturing	14	22	29	40		44	47
Transportation	5	6	9	7		6	6
Utility	19	19	20	22		26	26
Communication (Printing, TV, Radio and newspaper advertising)	3	7	8	9		10	11
Distribution (Wholesale, retail)	24	25	34	35	(37)	37	39
Financial (Banks, trust companies, investment dealers, stock)	(14	21)	19	17		11	16
Insurance	(	)	7	12		13	12
Other Service (Unions, professions and associations)	*35	36*	9	7		1	2
Service Bureau (Computer systems and software companies)	19	24	14	14	(28)	29	29
Government	51	49	51	38	(46)	66	78
Petroleum	3	7	10	10		11	2
Educational			30	35		57	66
Medical			11	8		12	15
Legal			–	1		1	1
Accounting			–	–		–	19
Hospitality			–	–		–	–
Other	2	4	10	5		4	6
Industry Class not identified	–	–	2	9	(10)	15	9
TOTAL	**199**	**231**	**276**	**283**	**(308)**	**357**	**398**

Table A2.26 (continued)

	Prince Edward Island					
	1978	1979	1980	1981	1982	1983
Industry						
Primary or Resource (includes agriculture, forestry, fisheries and mining)	–	–	–	1	1	–
Construction	–	–	2	2	1	4
Manufacturing	–	–	1	1	1	2
Transportation	–	–	–	–	–	–
Utility	1	1	1	1	1	1
Communication (Printing, TV, Radio and newspaper advertising)	–	–	–	–	1	–
Distribution (Wholesale, retail)	1	1	3	3	3	4
Financial (Banks, trust companies, investment dealers, stock)	–	–	–	–	–	–
Insurance			–	–	–	–
Other Service (Unions, professions and associations)	* 1	1*	–	–	–	–
Service Bureau (Computer systems and software companies)	1	1	1	1	1	–
Government	5	3	3	5	(13) 12	18
Petroleum	–	–	–	–	–	–
Educational			1	1	1	1
Medical			–	–	–	–
Legal			–	–	–	–
Accounting			–	–	–	–
Hospitality			–	–	–	–
Other	2	3	–	–	7	–
Industry Class not identified			–	1	2	2
TOTAL	**11**	**10**	**12**	**16**	**(24) 30**	**32**

Table A2.26 (continued)

	Ontario						
	1978	1979	1980	1981	1982		1983
Industry							
Primary or Resource (includes agriculture, forestry, fisheries and mining)	91	87	105	117	(121)	108	109
Construction	51	63	68	72	(77)	75	69
Manufacturing	1,010	1,013	1,261	1,268	(1,312)	1,359	1,468
Transportation	91	105	122	123		127	118
Utility	144	161	200	153	(400)	472	470
Communication (Printing, TV, Radio and newspaper advertising)	156	161	172	171		216	235
Distribution (Wholesale, retail)	445	453	502	538	(549)	537	582
Financial (Banks, trust companies, investment dealers, stock)	(230	273)	169	189		195	173
Insurance			136	159	(167)	186	311
Other Service (Unions, professions and associations)	*458	528*	168	163	(166)	166	156
Service Bureau (Computer systems and software companies)	380	382	452	585	(926)	985	1,084
Government	467	462	541	522	(719)	806	821
Petroleum	74	100	134	133		142	78
Educational			420	490	(749)	1,259	1,480
Medical			70	92		110	122
Legal			9	11	(19)	19	30
Accounting			16	23		53	50
Hospitality			15	17		21	40
Other	106	128	105	97	(104)	98	154
Industry Class not identified			95	182	(241)	292	269
TOTAL	**3,703**	**3,916**	**4,760**	**5,105**	**(6,298)**	**7,226**	**7,819**

* Includes educational, medical, legal, accounting, and hospitality.

1978, 79, 80 - CPU's rent for $2,000 or more per month or purchase price greater than $80,000.
1981-84 - CPU's rent for $2,000 or more per month or purchase price greater than $70,000.

Because of the change to minimum value of CPU's reported, the data is not continuous. The bracketed figures in the 1982 column show historic data for 1981 based on the $70,000 minimum. Figures are given only where a difference from the 1981 column occurs.
Source: CIPS Census.

Table A2.27
Distribution of Microcomputers By Region in Canada as of January 1985

	%
Canada	100.0
Ontario	48.0
Quebec	20.8
Atlantic Provinces	5.6
Western Canada	25.7

Note: The figures given are based on estimates of the total number of microcomputers in business, schools and homes.

Source: Evans Research

Table A2.28
Summary Statistics - Establishments Primarily Engaged in Providing Computer Services
1981-1982

Canada and Atlantic Provinces

	Canada		Atlantic Provinces	
	1981	1982	1981	1982
Establishments	1,392	1,752	46	52
Working Proprietors	101	180	3	4
Paid Employees	20,495	22,137	426	468
Salaries and Wages	426,140	534,540	8,355	10,104
Total Operating Revenue $'000	1,102,243	1,347,677	20,605	23,913
Revenues generated outside Canada	58,764	72,580	x	x
Total Operating Expenses $'000	953,493	1,232,315	18,028	22,569

x - CONFIDENTIAL

Source: Statistics Canada Catalogue 63-222 'Computer Service Industry'

Table A2.29
Cable Television by Number and Percentage Distribution of Households
Canada and Atlantic Provinces
1980-1984

		Total Households '000	Percentage of Households	Households with Cable Television '000	Percentage of Households	Households without Cable T.V. '000	Percentage of Households
Canada	1980	7787	100.0	4271	54.8	3515	45.1
	1981	8026	:	4534	56.5	3492	43.5
	1982	8254	:	4923	59.6	3331	40.4
	1983	8460	:	5034	59.5	3426	40.5
	1984	8857	:	5319	60.1	3538	39.9
NFLD.	1980	142	100.0	32	22.5	110	77.5
	1981	144	:	40	27.8	104	72.2
	1982	148	:	51	34.5	97	65.5
	1983	151	:	56	37.1	96	63.6
	1984	159	:	59	37.1	100	62.9
P.E.I.	1980	34	100.0	11	32.4	23	67.6
	1981	35	:	11	31.4	23	65.7
	1982	36	:	12	33.3	24	66.7
	1983	38	:	15	39.5	23	60.5
	1984	40	:	16	40.0	24	60.0

Table A2.29 (continued)

		Total Households '000	Percentage of Households	Households with Cable Television '000	Percentage of Households	Households without Cable T.V. '000	Percentage of Households
N.S.	1980	253	100.0	111	43.9	142	56.1
	1981	257	:	117	45.5	140	54.5
	1982	263	:	122	46.4	141	53.6
	1983	270	:	126	46.7	144	53.3
	1984	292	:	148	50.7	144	49.3
N.B.	1980	196	100.0	83	42.3	113	57.7
	1981	202	:	84	41.6	118	58.4
	1982	206	:	84	40.8	122	59.2
	1983	209	:	82	39.2	127	60.8
	1984	229	:	105	45.8	124	54.1

Sources: Statistics Canada Catalogue 64-202 'Household Facilities and Equipment' May 1982 and 1983, March 1984, and 1977-1981 (revised estimates)

Chapter 3:

Theoretical Framework

The Atlantic provinces are Canada's most disadvantaged region. The telecommunications system of the region, however, is approximately equivalent to that found elsewhere in Canada. On the surface, these two observations appear to refute the proposition that telecommunications development and economic development go together.

A number of qualifications to this apparent result make it questionable, however. First, any expected relationship between telecommunications development and economic development is more complicated than can be demonstrated by doing a simple correlation between the two. Second, telecommunications infrastructure development is not the same thing as the development of telecommunications applications or usage. The former may be a necessary condition for a positive impact on development but it is not a sufficient condition. Third, development in the region might have been even slower with a less well-developed telecommunications network. Fourth, urban facilities and services may overly dominate the provincial picture. Finally, the new generation of enhanced services has not existed long enough to have had a significant impact.

Despite these qualifications, however, the apparent lack of a significant correlation between relative economic development and telecommunications development in Atlantic Canada is important. This admittedly over-simplified finding underscores a very real difficulty in assessing the development impact of telecommunications: the technology by itself is in fact neutral in the distribution of development benefits between regions. As a first step towards understanding this argument, we turn to a consideration of some characteristics of telecommunications.

Characteristics of Telecommunications

As an economic product, telecommunications has a number of important characteristics relevant to its economic impact.

First, telecommunications is not a single homogenous service. It is, rather, highly heterogeneous.

Second, telecommunications as a commodity exhibits strong externalities – benefits (or costs) which are not captured by the price system.

Third, one of the most unique characteristics of telecommunications is its speed.

Fourth, telecommunications will rarely be the only means available for accomplishing a message transaction. In turn, this means that the viability of using telecommunications over other modes of information transfer (e.g. mail, face-to-face meetings) will be primarily a function of relative cost per unit of benefit (or relative benefit per unit of cost).

Fifth, telecommunications investment may be highly indivisible.

While telecommunications has a number of other important characteristics (e.g. reliability, convenience), those just listed are particularly relevant to the assessment of the socio-economic impact of telecommunications.

Heterogeneity

The heterogeneity of telecommunications refers to the multiplicity of technologies and applications which fall under the telecommunications label. It is important to emphasize that it is not a single homogenous service or a unique production process, as the taxonomy of service offerings and the description of technologies in Chapter Two made clear. In assessing the socio-economic benefits of telecommunications, this means that 1) benefits may vary according to different applications and 2) not all applications are necessarily possible with all technologies. Data services, for example, are difficult to provide with step-by-step exchanges. By the same token, the development benefits of data services may vary considerably from those of voice services.

Externalities

Externalities refer to benefits or costs which are captured by, or imposed on, a party other than the immediate producer or consumer of a good or service and which are not reflected in the price of the good or service. Automobile pollution, for example, imposes a cost on many people other than car drivers or car manufacturers. The same is true of the effects of smoking on non-smokers. Both of these are examples of external diseconomies. An example of an external economy or external benefit would be if improved health care services result in a reduction of employee illness for a business. The business owners in this case will receive the benefits of extra work from their employees even though the owners do not directly provide or pay for the health care services.

In the telecommunications case, four types of externalities may exist. Three of these are positive and one is negative. On the positive side, there are:

1. Network externalities: As new subscribers join the network, existing subscribers gain since it is now possible to reach more people than before. Similarly, for a new person joining the system, the value of joining is greater, the greater is the existing subscriber body, because of the greater calling capability this represents.
2. Calling externalities: When a contact is made by telecommunications, the party called, as well as the caller, will likely receive some benefit. But only one of the two parties will pay for the contact under most forms of usage-sensitive pricing schemes. The party not paying thus receives a benefit which is not accounted for in the transaction price and hence is an external economy. When there is a flat rate subscription price in effect, as is the case for local service in Canada, this calling externality may be partly internalized to users as a group, since all users in a given local calling area contribute equally to the costs of the system. Individuals, however, may still gain in this case. Moreover, the groups as a whole will gain if total benefits exceed the revenue collected through flat-rate pricing.[1]
3. Indirect or secondary benefits externalities: As telecommunications gains increasing acceptance, implying both an increase in the number of subscribers and an increase in the average calling rate per subscriber, consumption and production activities throughout the economy may be enhanced either through an increase in the utility derived from existing activities, an increase in the production derived from existing inputs, or through enabling the introduction of

> new activities. The ability to use the telecommunications network to do one's shopping or banking, for example, may save time and money for individuals. The use of telecommunications to enhance health care delivery or the delivery of education services may improve labour productivity and hence total production in an economy. And so on. Telecommunications may significantly alter social customs, business customs and social/business contacts. All of these may have implications for socio-economic development in a particular region.

On the negative side, telecommunications may also be subject to congestion diseconomies. When, because of a capacity constraint in the network, a call or a call attempt by some subscribers prevents other subscribers from completing their calls, the subscribers unable to complete their calls will suffer an external diseconomy as will those subscribers intended to receive the uncompleted calls.

Congestion externalities may have implications for pricing and investment decisions as do the three positive externalities. But it is the network, calling and secondary benefits externalities which are of greatest relevance to the regional impact of telecommunications.[2]

Consider two regions A and B that are geographically separate but part of the same country, so that there are no artificial barriers to trade as might be the case between two countries. If the telecommunications systems in the two regions are linked, then users in each region have access to both regions in placing and receiving calls. The network, calling or secondary benefits externalities generated by inter-regional access and use of the network could accrue to either region or both. *A priori*, there is no way in which the external benefits of the system can be completely contained or even largely contained within either region. Thus, new plant investment in region A could, in fact, produce greater spill-over benefits for region B than for region A, even though the carrier making the investment in region A earns a satisfactory financial rate of return on the investment.

Speed

The speed characteristic of telecommunications contributes substantially to the "footloose" character of computer-communications-intensive activities and it is the single most important characteristic of telecommunications which *might* allow telecommunications to compensate for the disadvantages posed by distance for businesses operating in a periphery region.

A "footloose" industry, firm, or division of a firm is one which is technically location independent, i.e., technically it can be located anywhere in the country and still perform effectively. For an industry, firm, or division of a firm to be footloose does not mean that there are no locational determinants acting on the firm. The firm will still be responsive to such factors as the availability of an appropriate workforce or appropriate infrastructure support and it will still be responsive to costs of materials or other inputs. To be footloose, then, means that location, *in a technical sense*, is not important to getting the job done. For example, a pension fund may have to be located close to major financial markets in order for the managers of the fund to maintain the required level of personal contact with the market. The data centre for the fund, if it is maintained manually or on a computer with no networking capability, will need to be in the same location as the fund managers. In this case, both the fund managers and the data centre are location dependent, i.e., they are not footloose. Suppose, however, that the data centre computer acquires a networking capability and suppose that the necessary telecommunications network permitting high speed data transmission from anywhere in the country is in place. Then the data centre will become footloose. The job of maintaining records on the flow of funds, keeping contribution records, issuing pension cheques, etc., i.e., the tasks of the data centre, can be done from anywhere, if up-to-date information is always available to the fund managers. There is no longer any reason why the data centre must be in the same building or even the same city as the fund managers.

Many computer-communications activities will be of a footloose character as long as a reliable telecommunications network permitting rapid transmission of information is in place. Consider as another example the central computer facility of a major bank in Canada. Such a facility is essentially a stand-alone operation as long as two primary functions can be accomplished: account and loan information must be able to enter the computer from any of the bank's branches across the country; and individual file information and aggregate figures on deposits, loans and so on must be available to bank personnel at head office and at the various branches (for individual files, at least).

In other words the required level of interaction between the computer facility and the rest of the bank involves little person-to-person contact; it is essentially machine contact which is important. Moreover, the branch-banking feature of Canadian banks means that most entries and retrievals must occur over great distances regardless of where the computer is located. As long as the necessary telecommunications links to allow rapid, reliable data transmission between the computer and the various branches of the bank are in place, the computer facility, technically, could function as well in St. John's or Charlottetown as in Montreal or Toronto.

Yet another, more dramatic example, is that of a fire alarm/information system installed in Sweden in the 1970s. The computer containing the information base for the system was located in Cleveland, Ohio.[3]

The speed of telecommunications is also crucial to business in general in facilitating access to information, through either voice or data communications, from widely disparate locations. For businesses operating in periphery regions this could be particularly important. A periphery region, by definition, is one which is removed from the economic and social centre of the country. This means, typically, that it is removed from the primary market for goods and services, thereby placing businesses in the periphery region at a disadvantage relative to their centre counterparts. While the information accessible via telecommunications will not likely compensate fully for this locational disadvantage, it may offset it in part, sufficiently so that periphery firms will be able to broaden their market area and, as a consequence, their scale of operations. For telecommunications to function in this role requires that it be able to deliver information on demand and relatively instantaneously. The speed of the medium is the basis for such performance.

Cost/Benefit Ratio

While the speed of telecommunications as a mode of information-transfer has been identified as being of special significance, in general the viability of using telecommunications versus other modes of information-transfer is primarily a function of relative cost per unit of benefit or, in other words, the cost/benefit ratio.

Costs are both the direct user fees charges by the carrier and indirect costs, such as employee time, equipment costs, etc. Two points are of note here.

First, it is frequently the case that a firm has no separate, identifiable communications budget. Rather communications costs are absorbed inside the budget of operating departments. Without a firm idea of total communications costs, companies do not necessarily choose the optimum mix of communications modes. Furthermore firms often do not know the indirect costs of various modes of communication or information-transfer. Given that such costs are likely to be lower for telecommunications, on average, their omission may distort the comparison between telecommunications and other modes. For example, a comparison of $.34 for a first class letter from Halifax to Vancouver and a 3-minute phone call which costs $3.12 clearly favours using the mail. But this takes no account of such costs as the extra time involved in dictating and typing a letter versus dialing the phone. Second, certain indirect costs, in particular wage costs for clerical/secretarial/machine operator personnel, tend to be lower, on average, in less developed regions than in more developed regions.[4] Thus, especially for computer-communications-intensive firms, location in a lower cost region may permit significant savings, while the footloose nature of such firms means that, technically, there are no constraints on such moves.

On the benefit side of the cost/benefit ratio, characteristics of telecommunications such as speed and reliability may also influence the cost/benefit ratio of telecommunications compared with other communications modes.

For information transfers, i.e., communications transactions, to be efficient, the mode of information transfer used should be the one that yields the highest cost/benefit ratio. But because communications are frequently not treated as a separate cost centre, because indirect costs are not always taken into account and because certain benefits may not be taken into account, telecommunications may be underutilized by business. Insofar as this is so, the development impact of telecommunications will be reduced.

Indivisibilities

Incremental adjustments to the handling capacity of switching or transmission plant to accommodate a small number of additional users or usage may not always be possible, once the capacity of existing equipment has been reached. Equipment which will be used by only a small number of users or usage may not be viable to install. And add-on services may be possible only by replacing the existing switching or transmission plant in a given location. In other words, telecommunications investment may suffer the problem of indivisibilities.

The problem of indivisibilities may be either reduced or heightened by technological developments in telecommunications equipment. On the one side, equipment is now available which will allow incremental additions to switching centres beyond their original capacity, although the size of such additions and the limits on expansion capability vary by type of switching centre.[5] Also, for the case of digital switching centres, small remote modules (of 640 line capacity) greatly increase the flexibility of the network for accommodating incremental change. Indeed these remotes, over time, are forecast to lead to a substantial reduction in the number of major switching offices.[6]

On the other side, however, is the fact that the pace of technological change in recent years has been so rapid. In an environment where equipment may become obsolete more quickly, indivisibilities in plant investment may retard the rate at which equipment is upgraded. Not only do carriers have to be concerned with an appropriate return on the existing plant, they must also be concerned about committing a new plant facility where the pay-back period is a long one, if there is a probability of obsolescence before the pay-back period is achieved. For low-volume usage areas, such as rural exchanges, the pay-back period will be longer still and hence the problem more acute.

Switching equipment in many centres is, at present, of quite old vintage. As noted by Table A2.23, step-by-step and cross-bar exchanges are still in use in parts of all four Atlantic provinces. The early installation of digital equipment in many of these locations may not be economic because of low usage, long pay-back periods and/or the need to recover the cost of existing equipment. The common carriers in the Atlantic provinces do plan to have a fully digital network by the year 2007 and examples are to be found now of state-of-the-art digital switching technology in some quite small centres. But an immediate and uniform upgrading of the system is clearly not possible or viable. Thus, the rate of diffusion of new technology may be retarded and the areas most seriously affected are those which generate the least traffic.

This is not a problem unique to the Atlantic provinces. Step exchanges, for example, are still to be found in all provinces. Right across the country, satellite use by the common carriers was slowed because of the need first to recover the large investment already made in existing terrestrial transmission systems. Interestingly, fibre optic cable has now made satellites obsolete for long haul domestic traffic. This was not, however, a reason for by-passing satellite technology initially. In the coming years, the existing investment in coaxial cable and copper wire will also have major implications for the rate of adoption of fibre optics.

While this problem is common to all telecommunications concerns, it is to be expected that it will be most pronounced where one is dealing with sparsely populated areas, small users, and small numbers of users. These characteristics are *relatively* more dominant in the Atlantic provinces and the Prairies than in central Canada. The result is that the latest technologies and the services they permit are likely to be found first in the major urban centres, which, proportionately, are less important in the Atlantic provinces than in some other provinces such as Ontario. There may be exceptions to this in cases where upgrading of facilities in smaller centres is otherwise required, such as Newfoundland Tel's upgrading of Labrador service since it assumed responsibility for Labrador's telecommunications in 1974. Such cases, however, are still the exception rather than the rule.

Regional Development Implications

Owing to the externalities of telecommunications, as described in the last section, at least part of the development benefits of telecommunications investment in one region will accrue to other regions where the network is integrated across regions. This means that the region in which the investment occurs cannot fully capture all the development benefits of such investment. Moreover, for the system as a whole, the proportional shares of total development benefits from the overall integrated network will not necessarily be equal. If one region is less developed than the other, then it is likely that the proportional benefit shares will favour the more developed region.

Canada's common carrier telecommunications network, at least up to the present time, has been fully integrated both technically and, through Telecom Canada, organizationally. For the Atlantic provinces, this has helped to ensure that the average level and quality of service offered by the four Telecom Canada member common carriers in Atlantic Canada have been approximately on a par with the rest of the country. It also has meant, however, that telecommunications accessibility *to* the region by parties outside has been as great as accessibility *by* the region to parties outside.

With the average level of telecommunications infrastructure development in Atlantic Canada roughly on a par with the rest of the country, the telecommunications network in the region becomes neutral in determining the regional division of benefits. Equivalent plant in two regions, by itself, can produce either an equal or an unequal distribution of benefits between the two regions. An unequal distribution will result if either the benefits of *inter*-regional use of the combined network are disproportionately shared or the benefits generated by the *intra*-regional use of equivalent systems are of different magnitudes. The answer to their question will depend on the features of the regional economies (existing intra-regional trade, local production, etc.) and the extent to which telecommunications allows inter-regional trade to displace intra-regional trade and production, where such displacement favours one region over another. This, in turn, becomes the question of whether telecommunications promotes a centralization of economic activity or a decentralization of economic activity between regions.

Centralization vs. Decentralization

The impact of telecommunications on inter-provincial market opportunities for firms located in different regions has two dimensions: the location of firms (or parts of firms) and the market area served by firms.

In principle, firms in one region may achieve greater penetration of the market area of other regions with the aid of telecommunications and, for many computer/communications intensive activities, the footloose nature of these activities makes possible a location in any region. In other words, the technology itself is neutral in determining the distribution of impact between two regions, insofar as either region, theoretically, can gain relative to the other.

If one of the two regions, however, is less developed than the other, has a smaller local market, a greater distance to the primary national market, a less well-developed industrial base, lower average income levels, a less well-developed economic and social infrastructure and so on, then, in practice, this region is not likely to benefit proportionately from its telecommunications investment compared with the second region.

On the basis of size, attitudes, management practices and other locational attributes, centre area firms are generally better positioned than periphery region firms to take advantage of the opportunities of the information economy. For example, centre region firms would become better able to serve peripheral regions effectively from a central location, thus eliminating or reducing the scale of such present periphery region activities as inventory depots and local sales offices. While the technology theoretically would allow firms in either region to penetrate more effectively the market of the other region, centre firms, being larger and, therefore, on average, having lower unit costs, better distribution channels and greater marketing experience, are likely to be more successful moving against periphery firms than vice-versa. The technology would be a means of overcoming at least part of the "natural protection" traditionally afforded local firms in the periphery region. In cases where centre firms already have regional offices/plants, new communications systems would permit a greater centralization of management control. If, as a consequence, part of the management cadre located in periphery regions is removed, the income distribution in the periphery region will be skewed in a negative direction. The relocation of office workers engaged in footloose activities, which could go to the periphery region, could also go to the centre in the case of firms operating across the country, i.e., there could be even greater centralization of office workers than already exists; attitudinal factors, the management notion of "keeping an eye" on employees might be important in determining this result. Moreover, many computer-communications-intensive firms might find it difficult to move the entire firm to the periphery region, because of the need for management to stay close to financial markets, etc. While substantial divisions or departments of the business might be footloose and able to relocate, there could be a management reluctance to split the traditional organization of the firm in this manner.[7]

On the other side of the ledger, all of these effects could go the other way. Moreover, microprocessor technology may help to reduce the economies of scale advantage traditionally enjoyed by large manufacturing concerns. In other words, the competitive position of small businesses may be significantly improved as such developments as computer assisted design and manufacturing (CAD/CAM) techniques eliminate the cost disadvantage of small scale production runs. Further, insofar as this technology is suited to a greater degree of customization or individualization of products, a trend already in evidence in the marketplace in many areas,[8] the prevalence of mass produced products, which is much of the basis for the economies of scale enjoyed by large firms, may be reduced. Again this could work in favour of strengthening the competitive position of small and medium-sized firms.

In spite of these counter-arguments, the realities of the Canadian economy suggest that centre firms are likely to win as things stand at present. Periphery regions have fewer national market players than centre regions; they are starting from a less developed economic base; they offer less in basic infrastructure support; they have a smaller local market base on which to build; and they are under-represented in the necessary labour skills required for information activities.

If this analysis is correct, then it means that, left to market forces alone, the Atlantic provinces will lose ground, *relatively*, to other parts of the country as the information economy grows.

Technological Diffusion

The preceding discussion of the centralization/decentralization tendencies of telecommunications assumed equivalent networks in all regions. If, however, technological diffusion lags in less developed regions, this will further reinforce the conclusion on regional benefits just reached. Technology in this case includes not just the telecommunications network but all of the technology of the information economy, especially computers. Moreover, diffusion of network technology must be interpreted in terms of use, not just in terms of network capabilities.

Work by the Economic Council of Canada,[9] among others, has shown the rate of diffusion of new technology to be a potentially important explanatory variable for regional productivity.

> It should not be concluded . . . that regions where technology is less advanced have failed to adopt any technical innovations but simply that, in general, new methods of production are adopted later in low-productivity regions.[10]

While this Council study is now somewhat dated, some of their examples are nonetheless instructive. As of 1973, for example, according to the Council, the number of computers per million workers as a percentage of the Canadian average was 75% for the Atlantic region; 86% for Quebec; 122% for Ontario; 93% for the Prairies; and 84% for British Columbia. Comparable figures for 10 years before, i.e., 1963, were 28, 96, 136, 78 and 94 respectively. On the basis of these numbers, the Council report concludes:

> . . . indications are that its [computer technology's] introduction was earliest and fastest in high productivity regions and there was some years' lag elsewhere.[11]

The 1980 Economic Council report *Newfoundland, From Dependency to Self-Reliance* confirms many of these earlier findings in considering the rate of technological diffusion in Newfoundland versus Ontario. An interesting finding brought forward by this analysis is that there are major differences in rates of technological adoption between single establishment local companies and multi-establishment national companies (typically headquartered outside Newfoundland).

> Large organizations also have the advantage of maintaining head offices in central cities such as

> Toronto, Montreal, New York and London, where new technology is easier to acquire.[12]

These results support the earlier hypothesis regarding the importance of national firms and large firms to the regional distribution of information activities and the potential negative consequences of the information economy on regional disparities in Canada. They also add two further points.

First, while it may be obvious, it is nonetheless important to emphasize that new technology can have no effect if it is not used. Diffusion, rather than discovery, is what matters. Small firms in relatively isolated regions are not likely in many cases to be abreast of the most recent advances in technology or of their capabilities. They may not be able to use the equipment because their scale of operation is too small to make it viable or because the cost is simply prohibitive. Supplier marketing efforts are likely to be less intensive because of the smaller market size involved. Supplier support for servicing may, for similar reasons, be less adequate. And so on. It is not that surprising, therefore, to find that technological diffusion lags in less developed regions.

The second point comes from the deliberate choice of computers as the example drawn from the Economic Council's work. Our concern with technological diffusion is not limited to the technology of the telecommunications system. A variety of complementary technologies, of which computers are one of the most important, must also be in place for the full impact of new telecommunications possibilities to be realized. In some of these areas, Atlantic Canada appears definitely to be behind.

Centralization of Information

The potential increase in centralization of economic activity which may result from an expansion of the telecommunications network will, if realized, worsen the relative economic position of the present periphery regions. In addition to this possibility, however, there is also another form of centralization: the centralization of information, which may result. This will also have negative implications for periphery regions.

The two types of centralization are interdependent. As economic activity becomes more centralized, so will information. As information becomes more centralized, it will benefit centre area firms, causing economic activity to become centralized even further.

The adage that "information is power" contains much truth. An important feature of the information economy will be the growth of external data base services as well as internal information systems. These have implications from three different perspectives: the origin of the information, the location of the information base and the use of the information base.

In terms of origin, the concern is with whether Atlantic Canadians will have access to information on their own region and whether this information originates in the Atlantic region. Many of the information needs of business and governments in Atlantic Canada will, of course, be national or international in scope. But some of the needs will be local. More important, however, will be information intended for residential use and/or for educational purposes.

When all or most of the information received by individuals originates outside the region or when what individuals learn about their own regions comes from outside, there will be negative social/cultural consequences. It is already the case that most television in the region originates outside the region. The introduction of the national edition of The Globe and Mail (made possible by computer-communications technology) is a potential harbinger of a similar trend in newspapers. Few of the print publications sold in Atlantic Canada are Atlantic in origin or in subject matter. This is also true of the textbooks used in the schools of the region.

The point of this discussion is not to argue for a narrow parochial bias in responding to the information needs of the region but rather to argue in favour of an appropriate balance. As we move increasingly towards an age in which more of our information will be delivered electronically, distance will become less relevant and the ease of supplying information from large centralized sources, either national or international, will become greater. The need to include local information of local origin for social and cultural reasons must be heeded as this development proceeds. As noted by the UNESCO MacBride Commission,

> New technologies have ambiguous consequences since they bring with them the risk of making the existing communication systems more rigid and exaggerate their faults and dysfunctions. In setting up ever more powerful, homogeneous and centralized networks, there is a danger of accentuating the centralization of the public or institutional sources of information, of strengthening inequalities and imbalances and of increasing the sense of irresponsibility and powerlessness both in individuals and communities.[13]

The local origin of information will also be important for economic reasons. The notion of the individual as information provider[14] will not happen immediately but can be expected to become more prevalent with the emergence of further developments in distributed networks or hardware and software packages that will solve the standardization problem. Even in the absence of this potential role for individuals, normal business development in the information creation industry will represent new employment and income for the region where it originates.

The location of the information base – in other words, where we put the data centres, both internal company centres and external data base vendors – also will influence employment and incomes. It will also influence the attraction of a given region as a location site for information firms over time. If a given region is to capitalize to the greatest extent possible on the emergence of the information economy, it is important that it participate actively in the information industry itself rather than just passively serving as a user of the industry's products. Part of this could come on the information creation side, i.e., the information provider side, as just discussed. Part also, however, must lie in the packaging and distribution (marketing) side, where the value-added component is likely to be the greatest. Certain agglomeration effects can be expected in this industry, in terms of equipment suppliers, skilled labour force, telecommunications infrastructure support, and so on. This means that the more you already have, the more you are likely to get, because of the spillover benefits to new firms from locating near to an already established nucleus of activity.

Given the footloose character of the activities in question, parts of Atlantic Canada in theory could develop such a nucleus as well as, say, Toronto or Montreal. Whoever is first, however, thereafter will have a decided advantage.

The use of information is an issue primarily concerned with the impact of information technology and systems on existing economic activities. In other words, it is the question of applications by existing firms. In part, this was discussed earlier in this chapter under the heading of centralization. There is, however, another dimension to use, which is one of access.

From a use point of view, centralization outside the region, which still allows easy, affordable and unrestricted access by producers in the Atlantic region, will be as good as local supply from the user point in view. As already noted, there are several reasons why origin and location may matter, but from the business user perspective, these qualities will be largely transparent given network capabilities.

If, however, centralization of function also implies centralization of control with the consequence that access is restricted in some fashion, then local producers/users will be at an obvious disadvantage. Partly this will be a function of the carrier networks and their access policies. Network standards must continue to be equivalent, as they are at present, and the universality principle which has traditionally operated on the common carriers must continue to be applied. Partly, also, the question involves information on information. In other words, there is a need to ensure that Atlantic firms know what is available, how to obtain it and how to use it. Finally, it involves questions of the market structure, pricing policies and so on, adopted by the information service industry. All of these are questions which government policy may affect.

The questions of access and control take on yet another dimension in the context of internal business information systems. By definition, internal systems are not open systems, i.e., they necessarily have restrictions on use. If a centralization of economic activity takes place, then there will also be a centralization of the cumulative information base which goes with those activities. The impact of this, in turn, will be cumulative as existing control of information helps to solidify or strengthen the market position of centre firms while weakening that of periphery firms. This effect can only be countered if the economic activities themselves are diffused. Such diffusion could be horizontal (some part of a given industry/sector in each region) or vertical (different industries/sectors become the specialty of different regions). If, however, periphery regions are not to lose, some level of information control must be retained for these regions.

Summing Up

The preceding discussion outlines the basic features of a theoretical framework for analyzing the regional development impact of telecommunications services. Several key points stand out in this analysis and bear repeating:

1. A modern, up-to-date telecommunications infrastructure is a necessary but not sufficient condition for hypothesizing a positive relationship between telecommunications and economic development;
2. The way in which the telecommunications network is applied, as well as the terms and conditions under which it is made available for use, will be primary determinants of the economic impact on a given region;

3. The technology itself is neutral with respect to the regional distribution of benefits; it is other characteristics of the region (labour force characteristics, industrial structure, size, etc.) which will primarily decide the outcome in a free market environment;
4. The potential for greater centralization of economic activities and of information resources themselves is very real and is a likely outcome in a free market environment; the process, moreover, is self-reinforcing – increased centralization likely will beget even greater centralization;
5. The regional diffusion of technologies complementary to telecommunications in an information economy (e.g. computers, on-line data base services) will also influence regional impact; and
6. If the above hypothesis regarding the likelihood of increased regional centralization in an information economy is confirmed, existing regional economic disparities in Canada will be exacerbated; in turn, if this result is deemed undesirable, then government policy must assume responsibility for altering the outcome, acting in concert with private industry.

These conclusions, in turn, highlight a number of variables relevant to evaluating the regional development impact of telecommunications:

- the diffusion of telecommunications technology in a region both absolutely and relative to other regions
- the diffusion of complementary technologies (e.g. computers, on-line data base services) in a region both absolutely and relative to other regions
- the ratio of small and medium sized business to large business
- the representation of national market firms
- labour force skills/occupational structure
- labour costs
- the diffusion of the relevant technologies *within* the region
- the level of urbanization of the region
- the relative economic development of the region
- the industrial structure of the regional economy.

As shown in Table 3.1, these variables can be grouped into the two broad categories of "Factors Related to Diffusion" and "Factors Related to Applications". Diffusion and applications represent the two major issues which arise from the preceding theoretical framework. The variables themselves which fall under these headings have already been presented in the data in

Chapter Two. We turn now to a more detailed analysis of this data relative to our theoretical framework.

Table 3.1
Organization of Variables Relevant to Regional Impact of Telecommunications

Factors Related to Diffusion

- the diffusion of telecommunications technology in a region both absolutely and relative to other regions
- the diffusion of complementary technologies (e.g. computers, on-line data base services) in a region both absolutely and relative to other regions
- the diffusion of relevant technologies *within* the region
- the mitigating influences on current and future diffusion; the level of urbanization, the relative economic development of the region, and the industrial structure of the regional economy

Factors Related to Applications

- labour force skills/occupational structure
- labour costs
- market structure (ratio of small and medium sized firms to large business, representation of national market firms)
- the mitigating influences on current and future applications; the level of urbanization, the relative economic development of the region, and the industrial structure of the regional economy

Data Analysis

Demographic Factors

The demographic profile of the Atlantic region presented in Chapter Two provides a variety of observations relevant to both diffusion and applications.

The higher relative growth of rural population versus urban in recent years underlines the importance of addressing the diffusion of information technology *within* the Atlantic provinces, a point which is discussed in more detail below. The lower average level of educational attainment in Atlantic Canada potentially may have major implications for the ability of the labour force in Atlantic Canada to respond to the labour requirements of information activities. The age distribution of the Atlantic population reflects the greater tendency in the Atlantic provinces for people to leave the region during their working years, i.e., proportionately, people leave when they are young and return when they are old. Many of those who leave are likely to be among the better educated or the more skilled occupations. Again, this has relevance for the ability of the local labour force to respond to the changing labour market requirements of the information economy. Insofar as the new activities create new and rewarding job opportunities, however, many of those migrating may be induced to remain. Thus, there are both positive and negative implications which may result.

Labour Force Indicators

The labour force indicators in Chapter Two highlighted the higher unemployment rate in Atlantic Canada, the lower participation rate, the lower employment ratio, the importance of information workers and their breakdown and sex distribution, and the sectoral distribution of employment (excluding agriculture).

The higher unemployment rate in Atlantic Canada, the lower participation rate and the lower employment ratio are a reflection of the economic disparity of the Atlantic provinces relative to Canada as a whole. High unemployment and a low employment ratio reflect the lack of job opportunities in Atlantic Canada. The employment ratio is also influenced by the age distribution of the population noted earlier which, it will be recalled, was explained in part by migration patterns which, in turn, reflect job opportunities.

The relatively high rate of unemployment also means that the local market base of the Atlantic provinces will be weakened insofar as higher unemployment reflects a lower level of purchasing power in the local economy. The lower participation rate and employment rate are also indicative of this effect. The fact that the Atlantic provinces are small in population terms to begin with makes the effect of these labour market characteristics all the more significant. The import of this is to reduce the possibility of information industry firms (or other firms) developing solely on the basis of the size of the local market. The scale implications of the new technologies may reduce this problem but are unlikely to eliminate it altogether. This in turn means that in order for the technology to create new opportunities for existing firms or for new firms considering locating in the region, the firms must be able to export to markets outside the region. This is consistent with the capabilities of the technology which makes many activities distance independent. Nonetheless, the absence of a strong local market base provides no reinforcement to the consideration of an Atlantic location.

The fact that information worker-related jobs are already important in the region indicates the extent to which such occupations have already become a significant factor in the economy of the region and of the country. The figures for Atlantic Canada for "clerical and related occupations", "managerial, administrative and related occupations", "sales" and "service" are, however, still somewhat below the Canadian averages. Moreover, if "service" occupations are excluded, the difference, compared with the Canadian average, becomes more pronounced, except for Newfoundland. The "service" category reflects a number of jobs such as tourism-related occupations which may not be as directly relevant to the information worker category.

When we examine the remaining components, clerical and sales jobs represent a slightly higher percentage of the total for all four Atlantic provinces than for Canada as a whole, compared with managerial, administrative jobs. The latter will typically represent higher paying jobs than the former. Thus, the distribution of information related jobs for the Atlantic provinces shows some tendency towards a more negatively skewed income distribution. It has already been noted that the introduction of the technology could lead to a centralization of management for firms operating inter-regionally. The figures of Table A2.5 may indicate that this is already happening to a limited extent. More significantly, given the present pattern, a further loss of managerial jobs because of the technology could widen the present gap considerably. The final result could be a worsening of the difference in average incomes between Atlantic Canada and the rest of the country. An increasing centralization of management functions/personnel will also mean an increasing centralization of information and control.

An examination of employment by industry, excluding agriculture (which includes fisheries), as shown in Table A2.6, shows below national employment in manufacturing, the equal or greater importance of business and personal services within the non-agricultural sectors of the Atlantic economy versus the national average and the above national proportion of public administration and defence in Atlantic Canada.

The lower proportion of employment in manufacturing is a reflection of the lower level of industrialization of Atlantic

Canada relative to the national average. This underlines the proposition that the new generation of information activities may be of special importance for Atlantic Canada, if the development of this sector in the Atlantic economy can be encouraged in an appropriate manner. Atlantic Canada has not succeeded, despite considerable efforts by provincial governments and the federal government, in creating a significant and strong industrial base in the Atlantic economy. Moreover, the present trend towards Canadian free trade with the U.S., whether or not it is of net benefit to the Atlantic region,[15] may well threaten part of the existing industrial base in the region. As the Canadian economy evolves towards the information economy, Atlantic Canada's hope of overcoming regional disparities will lie in its ability to attract a significant share of information-based activities. The region failed in this respect in the industrial age. The changing structure of the economy which now looms presents a new opportunity. At the same time, the less than national proportion of manufacturing activity and employment suggests that the potential gains from the technology probably do not lie in manufacturing sector applications, despite the argument made earlier that the technology may reduce some of the traditional disadvantages of small scale, characteristic of Atlantic manufacturers. Overall, service sector applications are likely to be of greatest significance.

The already high proportion of service sector jobs in Atlantic Canada means there is some base of employment and activity on which to build. An examination of the breakdown by industry shows, however, that in the very important area of "Finance, Insurance and Real Estate" (FIRE), Atlantic Canada is below the national average. FIRE activities are important because these industries are ones particularly open to applications of the technology and ones having significant sub-sectors or components which are of a footloose character. The fact that these industries are already better represented outside the region than inside will make the task of competing in these activities a more formidable one.

The relative importance of "public administration and defence" for the Atlantic provinces is also important. Insofar as one of the implications of the technology is job displacement, the impact of such displacement in the public sector is not necessarily the same as in the private sector.

In the private sector, a gain in productivity from new technology translates to a lowering of costs which, in turn, enhances competition, generates more business and, thus, *in the longer run*, can lead to increased employment. In other words, while specific jobs may be eliminated, causing a loss of employment in the short run, the longer run effects of this may easily be *net* job creation. In the public sector, however, productivity gains mean net reduced employment *unless* accompanied by a growth in the scope or scale of government activities.[16] The latter option, in the case of municipal or provincial governments, will balance out the employment impact within the region. But for the federal government, expansion activities, and hence new jobs, may go to other regions, i.e., they need not stay in the region where the jobs are lost. More important, in the present environment of government spending restraint at all levels of government, it is unlikely that job loss from the introduction of technology will result in an offsetting expansion of government.

The breakdown of professional occupations in Table A2.7 shows the small proportion of these occupations represented in Atlantic Canada relative to the national average. This result is not surprising in that up to the present time such professions have been geared predominately to servicing the local market. The small size of the Atlantic provinces, both in economic and population terms, makes it entirely predictable that these professions will be relatively small in numbers in the region. For many of the professions shown, the new technology will not change this. It may have implications, however, for certain professions such as accountants, engineers, architects and lawyers in that it may assist in helping some of these individuals/firms to expand their markets beyond the local level. Within "other professionals", consultants would also be part of this group that would expand outside. The effect may, however, work the other way, i.e., professionals in these fields located outside the region will also be able to increase their business in the region. The existing professional base of the region could either be enhanced or diminished by the technology. Insofar as the existing numbers in the region provide less scope for specialization and more limited market contacts to begin with, the tendency may well be against the region if this phenomenon of a widened market for professionals proves significant. As and when the technology makes certain professions more footloose, there may be ways, however, to induce more professionals to choose the Atlantic region as their base of operation.

Economic Indicators

Tables A2.8 to A2.12 set out a number of income-related economic indicators for the Atlantic region. These figures reflect and/or reinforce a number of the observations already made on the basis of demographic and labour market indicators.

Table A2.8 shows that the Atlantic economies, individually and in total, are small, that growth between 1964 and 1982 has been large but below the national average and that the relative position of the four provinces vis-à-vis one another has not changed over this time. Per capita disposable income figures (Table A2.9) show the income gap between Atlantic Canada and the country as a whole even more dramatically. Wage and salary data (Table A2.10) does likewise.

The dramatic jump in wages and salaries performance in P.E.I. in 1982 and 1983 is important to highlight. In 1983, in particular, P.E.I. dramatically outperformed the national average. While several factors may help to explain this apparent anomaly, the relocation of part of the federal government's Department of Veteran Affairs to Charlottetown provides the most reasonable explanation. This is a prime example of a footloose activity, capable of being located anywhere in the country. Its impact on local income generation in P.E.I., as reflected in wages and salaries, is indicative of the effect which might be expected if more such activities could be located in Atlantic Canada.

In terms of income distribution, the household and family income figures show that the highest income groups are less well represented in the Atlantic provinces than in Canada as a whole, while the lowest income groups are better represented. This is also reflected in the fact that median incomes in Atlantic Canada are further below the national average than average incomes.

These income figures reinforce the previous conclusions regarding the relatively disadvantaged position of the Atlantic provinces. This, in turn, reflects the underlying economies of the region and the smaller market size and lower purchasing power of the market in Atlantic Canada. The income distribution figures indicate that the latter is skewed in a negative direction. All of this has significant implications for the viability of the Atlantic market for new, business and residential information services.

The Telecommunications Sector

The telecommunications sector, as previously noted, shows a level of network and service development approximately equivalent to the country as a whole. Except for Newfoundland,[17] by 1983 penetration rates were approaching the national level. The slower growth in such services as mobile units and WATS lines compared with the national average are most probably a function of lower demand for these services rather than any constraint on supply. Both the demand and the supply of such services, however, tend to be concentrated in urban centres. The lower level of urbanization in Atlantic Canada certainly explains part of the lower demand for these services. Availability within non-urban areas may, however, be a factor on the supply side. All services are not available throughout all locations within each province. This situation also applies in other parts of Canada. All carriers tend to concentrate so-called enhanced services in major urban centres because of demand, type of installed plant and/or the sometimes higher cost of provision to non-urban areas either because of distance or higher unit costs on account of smaller volumes. While these considerations are common to all parts of the country, the lower level or urbanization in Atlantic Canada relative to, say, Ontario, means that the overall penetration for many enhanced services is lower in Atlantic Canada than in some other parts of the country. This issue of distribution within the region is an important one, although it does not alter the primary conclusion that the overall network in Atlantic Canada is approximately on a par with the rest of the country.

It is noteworthy that, as recently as 10 years ago, there was a more considerable gap between the penetration levels and availability of services in Atlantic Canada versus other parts of the country than there is now. Comparable systems are, as previously shown, a necessary condition to posing the question of the spatial distribution of the benefits of telecommunications. The absence of comparability, on the other hand, eliminates much of the possibility of relative gain by the disadvantaged region. Thus, the "catching-up" which has occurred in Atlantic Canada in the last 10 years may prove to be a very significant development.

The importance of toll versus local service revenues in the Atlantic provinces was also highlighted by the data in Chapter Two. The situation is not unique to the Atlantic provinces, of course. But it is important in considering the regional implications of the debate on competition in the carrier market. The issue of competition will be discussed more fully in Chapter Five. For now the point to be emphasized is the change which competition could produce in the relative contributions of toll and local service to total carrier revenues.

Competition can be expected to lead to a lowering of toll rates and toll revenues. Lower toll revenues carry the implications that local revenues must rise if the financial position of the carriers is to be maintained. Higher local revenues, in turn, mean higher local calling charges, i.e., competition will mean a rate rebalancing between toll and local prices. Rate rebalancing can occur, of course, without competition. The CRTC, in denying CNCP's application for toll interconnect, initiated a process for further review of the issue, including the merits of rebalancing.[18] Other carriers in Canada, including some Atlantic carriers,[19] have begun to talk about rebalancing as well, perhaps in an effort to forestall competition. The pressures for competition at present lie on the toll side of the market. A unilateral decrease in toll rates by existing monopoly carriers would have implications on the revenue side for the profitability of new firms entering the toll market and, on the cost side, for the level of access charges to connect to the local networks of the monopoly carriers. As will be discussed in Chapter Five, rebalancing and/or competition may have negative implications for the future diffusion of services within provinces to rural areas and for small users, both business and residential, who are not heavy users of the long distance network. On the other hand, for the type of footloose activities which may be induced to relocate to regions such as Atlantic Canada, a lowering of toll costs may be significant.

Computers

As was pointed out in Chapter Two, the Atlantic provinces have gained only a relatively small amount in share of the Canadian total for computer installations since 1968 and most of this gain came before 1973.

The Economic Council of Canada in its 1977 report *Living Together* found that diffusion of computer technology in Atlantic Canada significantly lagged behind the country as a whole.[20] The figures in Table A2.24 indicate that, as judged by large computer installations, this situation has not changed since the Council's 1977 report.

The sectoral breakdown of computer installations shows service sector use dominating, with government the largest user within the service sector and utilities (including communications) ranking second. Use within the resource, manufacturing and construction sectors represents a relatively small share of the total.

Table 3.2 shows an industrial breakdown of telephones counted by customer locations for New Brunswick as of September 1984. A sectoral breakdown of usage is not available. Moreover, the sectoral breakdown of customer locations was available only for New Brunswick. The data in Table 3.2 is shown by sub-region of the province.

Table 3.2
Customer Locations by Sector / Sub-Region
NBTel
as of September 1984

	Agric	Fish	Forest	Mining	Manuf	Const	Trans Comm & Utilities	Trade	Fire	Service	Pub Adm	Total
Fredericton	21	1	8	8	222	258	215	1023	208	1264	454	3682
Moncton	22	3	6	5	438	487	387	2073	406	2482	661	6970
Northeast	17	20	5	24	200	260	189	1245	216	1195	445	3816
Northwest	26	0	1	1	173	161	160	892	159	913	299	2785
Saint John	20	16	5	19	307	319	339	1422	271	1593	510	4821
Woodstock	20	1	3	0	89	56	82	342	50	325	1140	1108
Total	126	41	28	57	1429	1541	1372	6997	1310	7772	2509	23182

Source: NBTel

As is obvious, service sector activities dominate the picture, accounting for 86 per cent of the total customer locations shown. Resource industries, manufacturing and construction account for only 14 per cent of the total. Within the service sector, services has the largest share, followed by trade and public administration (government).

Looking at the 1983 New Brunswick figures in Table A2.26, service sector activities represent approximately 81 per cent of total computer installations for all industries. Resource, manufacturing and construction account for only 19 per cent of the total.

While there is no reason to expect a perfect correspondence between computers and telecommunications usage on a sectoral basis and while the figures in Tables A2.26 and 3.2 refer to installations rather than usage *per se*, the closeness of the percentages is still instructive. The service sector, we have argued, presents the greatest potential for computer-communications applications. The pattern of present facilities of both computers and telecommunications offers strong support for this assertion.

Aggregate information on micro-computers is presented in Table A2.27. This shows that the overall percentages for Atlantic Canada versus other parts of the country are roughly in line with the figures for larger computer installations. No sectoral breakdown for micro-computers is available. There is some reason to believe that the resource manufacturing and construction sectors might be better represented for micros than for larger machines, given the characteristics of these sectors' applications of computing. There is, however, no way to confirm this hypothesis on the basis of available data.

The question of computers is important for many of the activities/applications of the information economy insofar as it is the *combined* use of computers and communications, rather than the stand-alone use of either, which distinguishes the information economy. In other words, computers are a complementary technology, whose diffusion is crucial to the ability of Atlantic Canada to profit from the changes/opportunities which will characterize the information economy.

Insofar as the diffusion of computer technology lags in the region, even though telecommunications technology does not, Atlantic Canada will be less well positioned than some other parts of the country to take advantage of the changes and new opportunities heralded by the information age. This conclusion is further reinforced by the data on business establishments primarily involved in providing computer services in Atlantic

Canada. As is obvious, this industry is not well represented in the region. Moreover the growth in establishments from 1981 to 1982 was only approximately half as great in the Atlantic provinces as in Canada as a whole.

These figures are significant not only because they reenforce the previous conclusion that the diffusion of computers in Atlantic Canada has lagged behind other parts of the country, but also because they highlight the relative lack of support services in Atlantic Canada. The availability of support services could be of major significance to computer (-communications) companies considering an Atlantic location. To some extent it creates a "Catch-22" situation: companies may not come if appropriate support services are not available while the support services may not come without an existing client base on which to draw. The only way out of this problem may well lie in government policy.

Cable: An Alternative Carrier Option

Cable television operators represent a potential competitor to the common carriers for many of the enhanced services of the information economy. As such, information on the level of cable operations in Atlantic Canada is of interest.

As Table A2.29 demonstrates, the level of penetration of cable for households is lower in Atlantic Canada than in Canada as a whole. This is, at least in part, a reflection of the lower level of urbanization in Atlantic Canada. The lower level of cable penetration of households relative to the telephone common carriers suggests that cable companies are not as well positioned in the Atlantic provinces as in other parts of the country to compete in the offering of residential computer-communications services such as monitoring services, information-retrieval services, and so on. On the other hand, the penetration rate of cable is highest in urban areas, although precise figures on the urban-rural split are not available. The urban penetration of cable coupled with the telco problem of switching centres in rural areas which may not be able to handle data or video, and transmission lines (copper pair wire) which have a similar problem, may make the potential for competition much closer in the major urban centres than the aggregate penetration figures would suggest is true at the province-wide level.

Cable has two other major problems versus the telcos, however. First, although it uses all coaxial cable and therefore does not have the line problem posed by copper pair wire which the telcos have (although over time fibre cable will eliminate this problem for the telcos), the existing cable plant is all one-way transmission. To provide many of the computer-communications services of the information economy, the plant will need to be two-way. Given existing plant, cable companies cannot provide two-way services. A related or corollary problem is that the existing cable plant has no switching capability and, in Atlantic Canada at least, has no addressing capability.

Some compromises are available to deal with these problems, short of a complete conversion of the existing cable plant. Addressing technology is available and, indeed, has been installed by a least one Ontario cable company for use in delivering pay-TV.[21] Also, some monitoring services such as fire or burglar alarm systems are possible to provide by using polling techniques, in the absence of a sending capability in the subscriber's home. Finally, services which rely on the use of personal computers as the subscriber terminal device can use downloading off a cable transmission to provide the user with a processing, interaction capability at the local level. Moreover, such systems can employ the phone system in a hybrid fashion to provide the uplink capability for such services as teleshopping or telebanking.[22] Nonetheless, the absence of a two-way capability is a distinct competitive disadvantage for the cable companies.

The second problem the cable companies have is that their penetration of the business and institutional market is almost non-existent. Historically, cable has been for TV services only and, therefore, has been almost wholly residential-based. In looking to the possibility of competing in the business market, the cable companies are starting virtually from scratch while the telcos already have an almost complete penetration of the market. With competition in the terminal attachment market now being introduced in Atlantic Canada, it is probable that, over time, local area networks, inside office buildings, for example, will be introduced. If this happens on a large enough scale, it may help the cable companies because it will permit them to hook into the building without the need for them to rewire the entire building. This development will take some time to occur at any significant level, however.[23]

On balance, there is little reason to believe that cable companies in Atlantic Canada pose any significant competitive threat to the telcos for the foreseeable future, particularly in business services but also in residential services. Any competition for the telcos which does emerge will likely come from other sources, as is discussed in Chapter Five.

Conclusions

The analysis of the data of Chapter Two supports the argument developed in the theoretical framework that the Atlantic provinces are *not* well positioned relative to other parts of the country to take advantage of the development of the information economy. Although the telecommunications infrastructure is quite adequate, at least in the urban centres, the diffusion of services throughout the provinces, the diffusion of complementary technology, notably computers, and the attributes of the economy, the labour force and the population pose major difficulties. With appropriate policies to treat these problems, the technology or, more correctly, the application of the technology, has potential as an instrument for regional development. Left alone, however, market and structural forces are likely to result in the Atlantic economies losing *in relative terms* as the information economy grows. We turn, in Chapter Five, to a more detailed examination of policy considerations. First, however, in Chapter Four, we present four case studies on present applications of the technology in Atlantic Canada: one of the education sector and three of individual business firms.

Notes

1. For a more complete discussion of network and calling externalities see R. Artle and C. Averous, "The Telephone System as a Public Good: Static and Dynamic Aspects", *The Bell Journal of Economics and Management Science*, 4, 1, 1973; L. Squire, "Some Aspects of Optional Pricing for Telecommunications", *The Bell Journal of Economics and Management Science*, 4, 2, 1973; and J. Rohlffs, "A Theory of Interdependent Demand for a Communications Service", *The Bell Journal of Economics and Management Science*, 6, 1, 1975.

2. For a more complete discussion of network and calling externalities see B. Lesser and L. Osberg. *The Socio-Economic Development Benefits of Telecommunications*, Appendix 4, (Halifax: Centre for Development Projects, Dalhousie, 1981).

3. (to follow)

4. Clerical wages in Halifax, for example, in 1984 averaged between $7.17 and $10.38 per hour, while in Toronto, the comparable figures were $7.54-$11.05 and in Montreal $7.97-$11.20 (Labour Canada, "Survey of Wages Rates and Working Conditions" October, 1984).

5. With step exchanges, new frames with 200 line increments can be added indefinitely; for cross-bar exchanges, 60 line increments can be made to a maximum of 1500 lines on smaller exchanges; for electronic (SP-1) exchanges, 400 line increments to a total (theoretically) of 37,800 lines; and with digital, new frames of 1280 lines can be added up to 30,000 lines in total.

6. MT&T, for example, expects that by the year 2000, the present 150 switching offices will be reduced to 25 offices, with exchange service for the rest of the province provided by small remotes of 640 lines per module and the capability of linking six modules together, i.e., providing 3600 lines, in the same location.

7. The discussion draws on B. Lesser and L. Osberg, "Telecommunications and the Location of Employment: Implications for Regional Development Policy in Canada", 1981, mimeo

and B. Lesser, "Regional Requirements of the Information Economy and Canadian Industrial Strategy" in C. Gotlieb (ed.), *The Information Economy: Its Implications for Canada's Industrial Strategy* (Ottawa: The Royal Society of Canada, 1984).

8. See, for example, A. Toffler, *The Third Wave* (New York: William Morrow, 1980).

9. Economic Council of Canada, *Living Together: A Study of Regional Disparities* (Ottawa: Supply and Services, 1977) and Economic Council of Canada, *Newfoundland: From Dependency to Self-Reliance* (Ottawa: Supply and Services, 1980).

10. Economic Council of Canada (1977), *op. cit.*, pp. 87-88.

11. *Ibid.*, p. 92.

12. Economic Council of Canada (1980), *op. cit.*, p. 80.

13. UNESCO, *op. cit.*, p. 32.

14. See, for example, G. Thompson, *Memo from Mercury*, (Montreal: IRPP, 1979).

15. For a discussion of some of the implications of free trade with the U.S. on the Atlantic provinces see B. Lesser, "The Frying Pan and the Fire", *Policy Options*, 6, 9, 1985.

16. The point is made in J.B. Goddard, "Technology Forecasting in a Spatial Context", *Futures*, 1980, p. 92. See also B. Lesser, "Technological Change and Regional Development", in W. Coffey and M. Polèse (eds.), *Still Living Together* (Halifax: IRPP, 1987).

17. The lower penetration rate for Newfoundland most probably reflects the economic and geographic characteristics of the province, in particular the low income and relative remoteness of the interior and northern parts of the island. Newfoundland Telephone, which has sole responsibility for service in Labrador has adopted a policy that provides exchange service to any settlement with 30 or more permanent households. Terra Nova Tel, which has

responsibility for the interior and northern portions of the island, does not have a comparable policy.

18. CRTC, Decision 85-19.

19. NBTel has been the leading Atlantic carrier in this respect.

20. Economic Council of Canada (1977), *op. cit.*

21. Rogers Cablesystems is using addressable technology for delivery of pay-TV services.

22. The NABU Network, for example, incorporated downloading off a one-way cable broadcast, a micro-computer in the home and a telephone uplink for limited user responses.

23. For a more general discussion of the potential of cable as a competitor to the telcos in the offering of computer-communications services, see B. Lesser and L. Vagianos, *op. cit.*, pp. 90-94.

Chapter 4:

Four Case Studies of Telecommunications Use in Atlantic Canada

The application of telecommunications technology is the key to the impact of the information economy on periphery regions. This chapter examines the current state of applications in three Atlantic business firms and in the education sector. These illustrative cases were not chosen because they represent situations where the use of the technology is already well-advanced. To the contrary, as the subsequent discussion shows, in almost all cases the use of the technology is still at a very early stage.

Each of the four case subjects was chosen, however, for very particular reasons. One subject is Fishery Products International, the large Newfoundland fish processing company, representing not only a large firm but one in a traditional resource-based industry and one which operates in international markets. Process Technology Limited is a medium-sized, "high-tech" manufacturing firm located in New Brunswick. It is also an export-oriented firm. Evans, Yeatman and Endal (Associates) Limited is a naval architecture firm, a small service sector company with two offices, one in St. John's, Newfoundland and one in Dartmouth, Nova Scotia. It also operates in world markets. Finally, the education sector is government-funded, highly decentralized, widely dispersed and involves a "product" which will be key to the success of information activities in the Atlantic region – education.

The four cases form a cross-section of small, medium and big business; primary, secondary, and tertiary activities; public and private institutions; and both local and export market orientations.

It is emphasized that these cases are *illustrative only*. It is not possible to draw general conclusions based on such a small sample. The cases will be used, however, to see whether they offer support for the general hypotheses advanced in earlier sections of this study.

Process Technology Limited

Process Technology Limited (PTL) is a New Brunswick firm, located in Oromocto, which manufactures chemical vapour deposition equipment. The company's products are used by semiconductor manufacturers for depositing thin films on silicon wafers during the manufacture of integrated circuits.

PTL also operates a wholly owned research and development company, PTL Research Ltd., which is also in Oromocto.

In 1985, PTL employed 101 people and PTL Research employed 23. The company sells primarily in the United States but has also achieved sales in Japan and the Middle East. In 1985, the company entered the European market with sales in France, Switzerland and Scotland. Over 80 per cent of sales continue to be in the U.S., however, with approximately 90 per cent of total sales outside Canada. The company was one of only 12 companies to receive a Canadian Export Award in October 1985 for "exceptional performance in exporting over the past year."

During 1986, PTL encountered financial difficulties. As of the fall of 1986, a reorganization of the company coupled with an infusion of money by the New Brunswick Government had occurred. An over-commitment on research has been cited as the source of the company's problems.

PTL was started in 1982 by George Jenkins, who had developed a new thin film deposition process while working for BNR/Northern Telecom. Northern Telecom was not interested in going into the manufacture of the process itself and agreed to give Jenkins the licence, on the basis of which he started PTL. Originally the process applied to four-inch wafers but has since been developed to also be used with two, five, six and eight-inch wafers.

Jenkins chose New Brunswick as the location of the company, despite the fact that New Brunswick boasted very few other "high-tech" companies. In terms of possible agglomeration effects, a location such as Ottawa, where most of PTL's Canadian sales occur, would probably have made more sense. But Jenkins, a native New Brunswicker, believed that high tech could work in the Maritimes and was determined to use PTL to show it could be done. Transportation costs, historically an impediment to manufacturing development in the Atlantic provinces, were not perceived as important for PTL in view of the high value to weight ratio of the product, i.e., from a transportation cost perspective, the company is viewed as essentially location independent.

Total company sales in 1984 were approximately $7.5 million. As noted above, these were 90 per cent outside Canada. The company sells abroad through a system of agents in the U.S. plus Plymouth in the U.K., Zuidwolde in The Netherlands, and Japan. It relies heavily on attendance/ participation in trade shows for gaining new market exposure. It is the only producer in its field in Canada but faces about 12 competitors in the U.S. PTL also relies heavily on general industry contacts (both customers and non-customers) to keep in touch with new developments and for gathering general market intelligence. This function is served in part by the trade shows and in part by a wide range of personal contacts by head office staff and agents.

Other than its overseas agents, the company maintains no staff outside of the head office location. Although some agents' staff are being trained in Europe for minor service functions, all installation and servicing of PTL systems is handled by staff sent out from New Brunswick.

In 1985, a 12½ per cent share of PTL was bought by Brungro, a subsidiary of Bruncor Inc., the holding company formed in 1985 out of NBTel. This sale was made by PTL in order to provide capital for expansion as well as to strengthen the board of directors. Further, Bruncor's relationship with Northern Telecom via Bell Canada provides PTL with a potentially important industry link.

On the communications side, PTL relies heavily on the telephone network and telex and FAX for contact with its customers and suppliers. To date it has used, primarily, the public-switched toll network of NBTel/Telecom Canada, spending $10,000-plus per month on approximately 1,500-plus calls per month. The company avails itself of zone calling (a form of limited WATS calling), particularly for calls to Saint John, Ontario and Quebec. It is awaiting NBTel's offering of an international out-WATS service which is expected to reduce the cost of toll calls to the U.S.[1] The company's high volume and cost for long distance calling is felt to be directly related to its being located in New Brunswick.

PTL also makes considerable use of both telex and FAX. A new (1985) FAX machine is displacing part of the company's previous telex traffic. Both telex and FAX are attractive compared with, say, electronic mail, which the company does not use at all, because a) most of the company's contacts have either telex or FAX equipment, while they do not typically have the terminal equipment required for electronic mail and b) telex and FAX are considered more compatible with time zones changes, given the wide geographic dispersion of the company's customers. FAX has the additional benefit over telex of delivering hard copy identical to the original, a characteristic which the company views as desirable. The documents in question, however, are text; the company does not use the FAX for transmitting either drawings or graphics.

On the communications equipment side, all telephone equipment is supplied by NBTel, except for one night phone answering machine. The telex machine is from CNCP and the FAX machine from a commercial supplier.

On the computer side, the company has five dedicated word processors, several IBM PCs (used primarily by PTLR), a small CAD system (also used by PTLR) and one Radio Shack micro. All of these machines are operated on a stand-alone basis, i.e., they are not internally networked. The company has been considering the purchase of a new computer system such as an IBM 36 which would have this capability. There is also no external networking with the exception of one link, via an IBM PC, with a U.S. researcher with whom the company has a contract and where the on-line link is being used to pass technical data as well as progress reports.

The company's use of both computers and computer-communications equipment has been constrained by two primary factors. Internally, the company does not have the type of integrated, automated office system it might like primarily because of cash flow concerns. Externally, quite apart from their own equipment and capabilities, most of their customers/suppliers do not have the equipment to connect to PTL electronically, except for telex, FAX or conventional telephone. In some cases, the customers or suppliers are not automated at all, while in other cases, types of equipment are incompatible.

In addition to its electronic communications, the company communicates externally through mail, courier services, and face-to-face meetings, i.e., travel. Courier services are used quite extensively because mail has proven unreliable for relatively rapid needs. Whether this problem with mail is influenced by the company's New Brunswick location is difficult to say. While courier services have proven better and are used whenever there is an urgency to the communication, there have also been problems here with delivery of items on time. PTL management feels this is attributable to its New Brunswick location and the relatively poor air service available through Fredericton.

Air service through Fredericton has also proven unsatisfactory for the company's travel requirements. As a result, the company has purchased its own small six-seat, propeller-driven plane which is used to help to get small pieces of equipment to customers quickly and to get company executives to a larger centre, say Boston, where better air connections are available.

The company's travel is primarily for three purposes: for field service staff setting up or servicing equipment; for marketing purposes, including customer visits and trade shows; and for investigating new industry potential. In the company's estimation, all of these contacts require travel, i.e., the company sees little, if any, substitution possibility with electronic communications.

PTL's information/market intelligence needs are satisfied through marketing trips (trade shows, etc.), sales agents reports, and subscriptions to a number of print publications. The company does not subscribe to any on-line information services. It would be prepared to consider the latter if such services were shown to be cost competitive with print materials and if the content was relevant to the company's operations. Most of the information available to the company, outside of personal contacts, is of a relatively aggregate nature. The industry in which it operates is very small and highly specialized so that there is currently no dedicated information source, on-line or print, available. Nor is it likely that there soon will be, given the limited market facing any potential vendor of such a service (publication).

Moreover, the company does not regard the timeliness which on-line services can provide as being particularly important to it, given the nature of its operations. Also, much useful information which the company gains from various print sources are found through browsing, which can be relatively expensive when done on-line.

Finally the company feels that competition in the telecommunications field would be a good thing because it expects that competition would mean lower long distance calling charges. It is lower long distance charges rather than competition *per se* which is desired, however. The company would be equally satisfied if the existing monopoly carrier, NBTel, were to have a rate rebalancing that achieved the same result without the introduction of greater competition.

Evans, Yeatman and Endal (Associates)

Evans, Yeatman and Endal (Associates) Limited (EYE) is an incorporated partnership of naval architects with a head office located in Dartmouth, Nova Scotia and a branch office in St. John's, Newfoundland. In 1985, the firm employed 13 people at the Dartmouth office and three in Newfoundland. The firm has operated since 1972 and is engaged in a variety of naval architectural and related fields, including ship design and modification work, survey work and offshore-related activities. EYE, while small (gross revenue $750,000-$1,000,000 per year), is active in pursuing new contracts and willing to participate with other firms and/or governments on a joint venture basis. For example, developments in offshore energy in eastern Canada led the firm to develop some expertise in the field of drill ships and drilling rigs and this, in turn, has led to a co-operative agreement with European firms specializing in the offshore.

The firm is small enough that the president is able to oversee all aspects of the business, both of a technical and administrative nature. Communications development is not perceived as the single responsibility of any one person or department, although one staff member handles matters pertaining to the computer. Decisions respecting routing of information largely depend on historical patterns and the anticipated effectiveness of introducing new technology, including its compatibility with the equipment of clients.

EYE constantly uses telecommunications technology in its daily operations, both in contact with clients and with the branch office in Newfoundland. Supervision of construction of vessels requires on-site personnel who contact the head office frequently. This supervisory capacity has taken place in a number of locations, for example Japan, Norway, U.S.A., and Latin America, as well as closer to home, and rapid communication is necessary for effective management of these projects.

The work carried out in Newfoundland is generally handled co-operatively with the Dartmouth office. This two-way flow of work, which depends to a large extent on the volume of work in progress at either office, requires frequent consultation between offices, as well as the technical and administrative support provided by the Dartmouth office to the St. John's office.

Both offices use the public switch network for all voice communications, including those between offices. The Dartmouth office has a PBX with five lines connecting two telephone sets and 10 extensions via an intercom system. The Newfoundland office has three telephones. All of the equipment is rented from MT&T and Nfld. Tel respectively, although purchase of telephone sets has been considered. Of the five lines in the Dartmouth office, one is reserved for data transmission; a modem for the computer is rented from MT&T.

Telephone service costs for the period Oct. 1984 to Sept. 1985 for Dartmouth was approximately $13,400 and for Newfoundland approximately $8,400.

An analysis of telephone bills for the period October 1984 to September 1985 showed that approximately 54 per cent of the total bill is attributable to long distance charges. Table 4.1 shows the breakdown of long distance destinations by dollar amounts and by volume. The volume of domestic calls represent approximately 90 per cent of all long distance calls, with the balance fairly evenly split between the U.S. and other foreign countries. These proportions do not hold, however, when translated into cost terms; for example, while overseas calls constitute 4.83 per cent of the number of calls (not weighted by time), the cost of those calls is 16.72 per cent of the long-distance bill.

Table 4.1
Long-Distance Telephone Communications
Evans, Yeatman, Endal - Dartmouth Office
1984-1985

Destination	% of total bill	% of long distance bill	Number of calls	% of long distance calls
Atlantic Region	26.80	49.48	990	59.75
Remainder of Canada	16.28	30.00	516	31.14
U.S.A.	2.00	3.70	71	4.28
Overseas	9.00	16.72	80	4.83

The results of a similar analysis conducted for the St. John's office are shown in Table 4.2. Again, as with the Dartmouth office, domestic calls predominate, accounting for over 95 per cent of all long distance calls. However, in the Dartmouth case the Atlantic/remainder of Canada split is 60 per cent/30 per cent whereas the St. John's office calls are divided 86.5 per cent to 9 per cent. The Atlantic region calls also account for more than 55 per cent of the total telephone bill for the St. John's office. Not only is the number of Atlantic calls for the Newfoundland office disproportionately high compared with the Dartmouth office (634 calls from 3 employees versus 990 calls from 13 employees), but also the average cost per call is more than double – $8.39 versus $3.61. MT&T and Newfoundland Tel both charge the same rate for a Halifax-St. John's connection. Much of the discrepancy in average cost per call, therefore, must be attributed to the frequency and length of calls initiated from St. John's to the head office. It is not unusual to find three or four calls per day, some exceeding 20 minutes. The nature and size of the Newfoundland office demands access to head office expertise and guidance on an almost continual basis. This precludes face-to-face discussion and postal transactions, the former because of cost and non-continuity and the latter because of time requirements.

Table 4.2
Long-Distance Telephone Communications
Evans, Yeatman, Endal - St. John's Office
1984-1985

Destination	% of total bill	% of long distance bill	Number of calls	% of long distance calls
Atlantic Region	55.90	84.40	634	86.50
Remainder of Canada	5.22	7.88	66	9.00
U.S.A.	1.15	1.74	13	1.77
Overseas	3.96	5.98	20	2.73

Data communication is largely handled by telex, although some infrequent use is made of the computer as a communication tool.

The Dartmouth office leases its telex from CNCP at a cost of $98.70 per month plus a $57 per month network access charge. The Newfoundland office has a similar arrangement (through Terra Nova Tel) at a cost of $152 for equipment per month and a $58.30 network access charge per month. Domestic calls in both cases are charged on a pulse usage basis (currently at .0342 per pulse) while the categories USA, TWX and other, and overseas (via Teleglobe) have a rate structure based on a combination of distance and pulse usage. Table 4.3 shows a comparison of domestic telex usage and total telex costs for the two offices. The 12-month period differs for the two offices: for St. John's it covers August 1984 to July 1985, for Dartmouth it covers September 1984 to August 1985. This difference, however, is not significant. Usage charges expressed as a percentage of the total bill are 24.2 per cent for the Newfoundland office and 58.58 per cent for the Dartmouth office. Given the higher equipment charges levied on the Newfoundland office (approximately $650 more per year), it may seem that the Newfoundland office has difficulty justifying the lease of the telex. Clients expect, however, that telex access will be available. It is also worth noting that the proportion of

Table 4.3
Telex Usage - EYE
1984-1985

	Dartmouth	% of usage cost	St. John's	% of usage cost
Domestic Pulse Usage	27,895	units	8,825	units
Cost of Pulse Usage (dollars)	$ 934.87	25.18%	$ 292.89	30.32%
USA, TWX & other (dollars)	$ 115.17	3.10%		
Teleglobe (dollars)	$2,662.23	71.71%	673.01	69.68%
Total Cost	6,337.54		3,985.72	

calls broken down by destination is similar for both offices, with only a slightly higher proportion attributed to domestic calls from the Newfoundland office. Telex use for both offices is confined largely to transmission of factual information to clients, and confirmation of receipt or delivery of information.

The breakdown of the telex charges confirms that there is not a significant information flow between the two company offices via the telex. This also affirms what has been reported in interviews: that discussion rather than data transmission is the major component of the inter-office communication taking place, a role which telex cannot fulfill as adequately as voice service.

EYE owns an Alpha-Micro Computer (200 K, 20 Megabyte disk), five terminals and two printers, all of which are in the Dartmouth office. One additional terminal is leased from The Technical University of Nova Scotia (TUNS) in Halifax and one modem is leased from MT&T. The firm uses dial-up access and devoted a single telephone line for this purpose. Current charges are $47 per month for the telephone line and $71 per month for the modem.

The computer is used in a variety of ways. Approximately 85 per cent of all computer work is done "in-house". Of this 85 per cent, 75 per cent is devoted to word processing and specification writing and 25 per cent to technical calculations. The remaining 15 per cent of total computer work is handled in two ways – 5 per cent at TUNS and 10 per cent on the Cybernet System of Control Data Corporation (CDC) of Mississauga, Ontario. CDC also handles a CAD program which is used exclusively for drawings. Access to Cybernet is made via TUNS or through Datapac. The CAD system is available directly or via Datapac. Computer tape storage charges are estimated to be $1,000 per year; other charges are on a usage basis.

Although the technology for computer communications is in place, it is rarely used. On occasion, calculations have been transmitted to the British Shipbuilding Research Association (BSRA) in England and the solution returned via computer, but this type of problem solving is rarely necessary. When tank testing is handled outside the firm, there is typically enough lead time to allow for mail transactions. Occasionally, use has been made of a telecopier owned by a neighbouring firm to send rush information to the tank test facilities but again the volume is not felt to be large enough to warrant investigating alternate methods of data transmission.

Ships are designed to meet stringent requirements set by insurers. For example, Lloyds has available computer packages to calculate and verify that their standards have been met. This service must be paid for by users and in most cases, the additional precision gained from the computer process is not required to actually meet the standards set out. EYE makes no use of this type of service.

EYE's computer has the capacity to allow users to dial into its system but the company does not see any need to institute this practice. The Newfoundland office does not have direct access to the computer, as neither office perceives it necessary.

One inter-office application that would initially seem to be ready-made for data transmission is in the accounting department. Current practice is to mail or telephone bookkeeping information from Newfoundland to Nova Scotia, which is then handled manually at the Dartmouth office. Accounting information is *not* stored in the firm's computer for two reasons: a software package to handle accounting data was previously tried and was discarded when it failed to operate satisfactorily, and the capacity of the machine, and support equipment, lack accounting applications. To upgrade the system would require a considerable financial investment the firm does not wish to incur at present. There are plans, however, to purchase a stand-alone machine for accounting purposes only. In general, there is no consistent direction linking computer technology and the administrative aspects of the business; the primary emphasis of computer applications is on the substantive, engineering work of the firm.

The firm is aware of electronic mail, teleconferencing and electronic information services but seldom, if ever, uses them. The former two services do not provide any more efficient routing than the traditional means. The latter service, electronic information retrieval, has been used but not on a frequent or constant basis. BSRA has an information service that stores journals and abstracts which EYE can access, and has done, but the information needs of the firm are usually satisfied by non-electronic means such as trade journals and bulletins in print form.

Recently (early 1986), EYE installed telecopier machines in both the Dartmouth and St. John's offices. A telecopier was previously used in 1981-82 for one job at the request of a client. The trial was deemed unsuccessful for two reasons: the staff were frustrated by technological failures of the machine which inconvenienced their work; and, at the conclusion of the initial contract, EYE felt that there were not sufficient other clients who had the technology in place to justify continuing to operate the machine. Now, however, installation of a telecopier has become more appropriate, as an increasing number of their contacts have acquired the technology.

Fishery Products International

Fishery Products International (FPI) is a company formed in 1983 through the merger of a number of the largest fishing companies in Newfoundland. It is a vertically integrated seafood harvesting, processing and marketing company which operates its own fleet of offshore vessels, a large number of primary processing plants in both Newfoundland and Nova Scotia, and several secondary processing plants in Newfoundland and the United States. The company also has its own international marketing firm, Fishery Products Inc., in Danvers, Massachusetts.

FPI operates 28 primary processing plants in Newfoundland, eight of which are based on the company's offshore harvesting operations. One secondary processing operation is in Newfoundland (located in Burin) and two are in the United States. FPI owns one scallop processing firm in Nova Scotia, supplied by 11 scallop draggers. The company owns and operates a fleet of 67 vessels, 56 of which are based in Newfoundland ports. Fifty-two of these offshore vessels are stern trawlers.

Within Newfoundland, FPI employs 10,000 persons, most of whom are fish processing workers. About 800 fishermen are employed in offshore fishing operations; however the company also buys fish from about 6,000-8,000 Newfoundland inshore fishermen. The Nova Scotia scallop operation employs about 150 people, while head office and marketing activities in the United States employ 300-400 people. Yearly sales of fish products are in the order of $300 million.

FPI's ships operate primarily out of Newfoundland ports. Because of the richness of the adjacent Grand Banks and Hamilton Banks, most of the company's fleet are stern trawlers working the Canadian groundfish quotas on a year-round basis. The company's 56 wetfish trawlers range in size from 128 feet to 175 feet and supply approximately 8-12 of the company's 32 plants in Newfoundland and Labrador. The trawler fleet harvests primarily cod, flatfish of different species and round ocean perch. Each year these vessels land about 300,000,000 lbs. of raw material. FPI purchases additional supplies of groundfish from about 6,000 to 8,000 licensed inshore fishermen in Newfoundland and Labrador.

From both these sources of raw material the company expects to produce about 165,000,000 lbs. of groundfish products, of which approximately 108,000,000 lbs. will be cod and slightly over

41,000,000 lbs. will be flatfish, making FPI the world's largest producer of flatfish. The company also harvests and processes "Queen Crab" and scallops. It also operates a shrimp processing plant which obtains its raw materials from independent shrimp catching vessels.

While FPI does not operate a pelagic fleet, it does purchase, process and market pelagics such as squid, herring and capelin, depending on their availability from independent fishermen.

The plants range from small seasonal plants on the Labrador Coast to year-round operations which can process all types of groundfish or pelagics, freeze them and hold them in cold storage. The FPI plant at Marystown is a trawler-fed operation capable of cutting up to 470,000 lbs. of raw material (groundfish) a day. The plant uses both blast and plate freezers and can store 1,500,000 lbs. of product in its cold storage. The products range from blocks to IQF fillets (individual quick frozen). Offal produced during the heading, cutting and trimming operations is reduced to fish meal in the plant's own fish meal factory.

There are similar trawler plants in Catalina (410,000 lbs. per day) and Fortune (225,000 lbs. per day), as well as a 300,000 lb. per day plant in St. Anthony. Seven plants can handle between 150-200,000 lbs. per day and 13 additional plants can handle between 50-150,000 lbs. Of the remaining plants only one cuts fillets and it can handle 35,000 lbs. per day, while the rest of the plants are pelagic operations, secondary processing, or salt bulk plants.

The co-ordination and maintenance of plant operations is the responsibility of a vice-president of production and a group of regional plant managers, each responsible for a number of plants in various areas of the province.

The marketing division is responsible for the sale of the 165,000,000 lbs. of groundfish, as well as the variety of other seafood products which FPI produces. The company's major sales are in the food service segment of the American market and the sales of groundfish in the U.S.A. are in the area of 120,000,000 lbs. of product.

Sales in the U.S.A. are primarily handled by Fishery Products Inc., a subsidiary of FPI. The marketing set-up works through a network of 54 brokers and covers 100 per cent of the American market.

The remainder of the international and domestic marketing is done through headquarters in St. John's and through two sales offices in the European Economic Community European sales are around 23,000,000 lbs. of groundfish annually. The European sales offices are located in West Germany and England. Sales in the Pacific Rim countries and the marketing of fresh fish are handled through the headquarters operation in St. John's.

FPI also has its own product development division which is responsible for creating new product lines required to meet the changing tastes of the marketplace. The division develops and tests a variety of recipes and packs. The focus on value-added product places an emphasis on the company's ability to provide new, convenient and attractive end-use product lines.

Fishery Products International today markets about 155,000,000 lbs. of groundfish in North America and Western Europe and has the capacity and flexibility to fill the expanding market demand for groundfish in the Pacific Rim countries. While the backbone of FPI is groundfish, the company also has the capacity to market pelagics, shellfish and mollusks on a world-wide basis.

FPI's marketing strategy varies from country to country depending on local conditions. In the U.S.A., the company stresses the food service industry and this sector accounts for 65 per cent of company sales in the U.S.A.. FPI's access to the retail sales end of the trade, which accounts for the remaining 35 per cent of sales in the U.S.A., goes through some company label sales and through co-packing arrangements with major American retail brands. FPI is struggling to improve its share in both market sectors.

In Canada the situation is somewhat different Of the company's products destined for the Canadian market, 55 per cent are sold in retail sales and 45 per cent go to the food service industry. The present focus of FPI in the Canadian market is on the retail trade, where the company is achieving significant successes with its own labels. Sales in Canada are about 12,000,000 lbs. of groundfish annually.

The same type of approach is used in Europe, Australia and Japan. FPI plans its sales to meet a balance of existing and potential local market patterns and the production flexibility of the company. This approach allows the company to maximize its production capabilities and achieve market penetration on a broad front in many market areas. FPI views itself as a "market-driven" company in which production, product development and quality assurance are geared to meet the demands of a variety of existing markets and to fill the demands of the new markets as they are developed.

In all aspects of the company's fish harvesting, processing and marketing operations, FPI makes constant use of telecommunications technology in its day-to-day business affairs. With a large trawler fleet to deploy and manage, with over 30 plants in dispersed and often remote locations, and with international marketing activities, FPI uses voice and data communication as its primary method of information movement.

FPI leases tie trunk lines to its plants in Catalina, Marystown, Trepassey and Burin, and FX (foreign exchange) lines to plants in Bonavista, Fortune, Grand Bank and Fermeuse. Other plants use the public switched network for voice communications and each of the company's 30 plants is equipped with its own PBX.

Voice communication between the St. John's head office and FPI's foreign sales offices in England and West Germany is handled through normal long distance routing, as is the case with FPI's Boston office and U.S. plants. Traffic between St. John's and Boston is significant enough to justify plans to lease a dedicated line to Boston, which would be capable of handling both voice and data.

Voice communication with clients and other non-company locations is handled through the public-switched network.

FPI's trawler fleet communicates with home plants through single side-band radio and vessels use VHF radio to communicate with other vessels while at sea.

FPI operated a dedicated data network between its head office computer and approximately 50 per cent of its processing plants throughout Newfoundland and Labrador. Sixteen plants are currently on-line with the St. John's IBM System 38 computer, using IBM-compatible Memorex terminals. The network has consisted of 4,800bps and 2,400bps dedicated lines which are leased from the local common carriers. Newfoundland Tel, however, was recently awarded a contract to provide all of FPI's data network (previously shared with TNT). The new system will involve an upgrade to 9,600bps and will incorporate customer network management over a "full period" private line network.

The FPI plants which are not on-line communicate with head office via telephone or telex; most are equipped with telex. Data fed via telex are input into the computer by head office staff.

The on-line plants are, for the most part, equipped with back-up dial access to the head office computer. Modems are leased from the common carrier, and the monthly cost for the dedicated lines and the modems is about $10,000.

The network is completed by a second computer in the Boston office, which uses dial-up access, but which will be put on-line in the near future with a dedicated line to be used for data, voice, facsimile, telex and word processing.

FPI uses word processors extensively in the head office and operates one with a communication link to the Boston office. As is the situation with voice and data, this word processor communication is currently handled over public switched network, but in future will be carried over the dedicated line to Boston.

The network is used primarily by plants for entry of production, inventory, payroll and ledger data. Plants also input data which have been called in from the trawler fleet; this information includes estimated catch, catch by species, trawler status, and landings data.

The data network also provides a message switching service, using an IBM software offering on the headquarters computer. Larger plants which are on-line have a separate terminal and printer for message switching, and head office is equipped with a message switching centre.

Most of the computer-based activities within FPI rely on data fed into the system through trawlers, plants and marketing sources in the Boston office, and thus are communications-based. Data which need to be input from sources not on-line is transmitted by voice or telex, then input at headquarters. The two sales offices in Europe, like the off-line plants, use telex extensively. Communication with the 54 brokers in the U.S., through which FPI handles its U.S. marketing, is also handled through voice and telex.

The leased lines used by FPI support constant traffic, i.e., the data network is heavily used during the day. The system operates on a one-shift day, but data entry is available from all parts of the network 24 hours a day.

The computer at FPI has been obtained through a lease/purchase arrangement, and all other services are leased from the common carrier. Modems have been identified as an item which might in future be leased from alternate suppliers.

FPI's information management staff numbers seven in head office and four in the U.S., and they are primarily involved in computer and data processing activities. The company does not have staff specifically designated to communications, i.e. communications responsibilities are shared between a number of divisions.

Awareness of telecommunications services and systems is relatively high and some internal analyses are under way to evaluate the efficiency of existing systems and to explore the potential of the new and emerging services.

FPI's attitude towards the uses of the data network recognizes that it has operated more for the benefit of head office than for the remote nodes on the system. The company is examining the possibility of decentralizing some of the computer power to the plants in an attempt to assess the efficiency of the traditional margin-to-centre flow of data. There is some recognition that greater computer power in the plants could increase plant efficiency by giving plants the on-site ability to compute rather than simply to feed data into head office, as is now the case.

FPI also recognizes the need to train plant employees in computer use and application now and in the future. No widespread training program was undertaken when plants first were put on-line, but the company is attempting to redress that situation. Because many of the plants have been brought on-line recently, no full-scale evaluation has been undertaken by the company to assess the benefits and problems of its network, but there is a strong positive attitude on the part of the management towards the current and potential contributions of communications to the company's overall efficiency.

Although FPI does have a basic requirement for meetings between head office and regional staff, and is familiar with teleconferencing, there has not been any widespread use of this service, nor is it seen as a possible travel substitute for the type of meetings FPI normally holds. Some audio conference calling, using the public-switched network, has been used on rare occasions but to date it has not been viewed as holding significant potential for application within the company. No internal evaluation and analysis of its potential has been undertaken and no efforts to point out its potential seem to have been made by sources outside the company.

The internal message switching system which operates on the company's own computer is the only electronic messaging system used by the company. Although FPI is aware of such external messaging services as Envoy 100 and Infotex, these have not been adopted. For internal purposes they would not be more efficient or economic than the present system. Possible external use, which the company's own system cannot provide, are either not recognized or are deemed not justified by the cost.

Although FPI's activities in both domestic and international markets require current and constant marketing information, the company does not subscribe to any computer-communications services which would provide instant access to remote computer data bases. Information on marketing and commodity trends and sales and forecasting information, in its own and in competitive sectors of the high protein food industry, is obtained through traditional means such as trade journals, newsletters and other non-electronic sources. These are well established and varied and appear to serve the company's information needs fully.

The company subscribes to a number of industry newsletters, including the *Boston Blue Sheet*, that provide them with weekly and monthly data on market trends, demand and sales of fish products, as well as data on competitive sectors of the high protein food industry. In addition, FPI contributes to, and gains information from, the Canadian Association of Fish Exporters, which provides data on sales, inventories and pricing trends on an industry-wide basis in Canada through monthly meetings. FPI also makes extensive use of data from the Department of Fisheries and Oceans marketing research group which, through meetings and presentations, provides detailed estimates of market trends, demand per species and other relevant information.

The marketing information needs of FPI, in general, are seen as weekly and monthly rather than hourly or daily, thus minimizing the need for electronic access. The awareness of data base access services is high but at present FPI has not identified any services which would justify subscription. The company chooses not to subscribe to an international fisheries wire service that was under development some time ago, because the data it would have provided was not of sufficient priority within FPI's own information requirements.

The Education Sector

As in other parts of Canada, the Atlantic provinces were first exposed to a large scale communications project for the delivery of "social and educational services" through one of the Hermes-CTS satellite experiments of the 1970s. This involved a project implemented at Memorial University of Newfoundland (MUN), which focused on medicine and health uses. Though labelled "Telemedicine", this project incorporated a significant distance education component.

Upon completion of this project, MUN also became involved in an Anik-B satellite pilot project—to test the efficiency of satellite communications to extend audio teleconferencing; to further test slow-scan television transmission (an element of the earlier Hermes-CTS satellite project); and to establish communication links with an offshore petroleum installation to provide general communications, health care and educational services.

Other than these developments in Newfoundland, very little by way of co-ordinated or individual use of telecommunications technologies for educational purposes occurred in Atlantic Canada until the early 1980s. At that time, a new series of initiatives which can be described under the general headings of audio-teleconferencing and data communications were started.

Audio-Conferencing

Audio-conferencing enables three or more people at different locations to participate simultaneously in a meeting by telephone. Participants may use handsets or speakerphones or telephones connected to speakers together with microphones equipped with push-to-talk-buttons or hand switches.[2]

Various means of transmitting images during audio-conferencing have been introduced to augment or enhance voice-only transmissions. In Atlantic Canada, the telewriter, the electrowriter and the electronic blackboard have all been used to transmit and receive chalkboard-like drawings or sketches during lectures. As well, devices to transmit and receive photographic or chart-like images by slow-scan have been used in association with audio-teleconferencing.[3] It has also become quite common for teleconferences to be conducted in association with broadcasting, providing for the participation of the learner during or following an educational broadcast. This interactive participation is judged by most to be an essential element of the instructional process.[4]

Two types of teleconference delivery systems are used in education: the conference call and the dedicated system. Whichever system is used, it is necessary for participants in the conference to be joined together by a bridging device, which can be supplied by the telephone company or can be purchased from an independent manufacturer. Bridges supplied by the telephone company may be installed on the client's premises or may remain at the telephone company's premises and may be dedicated or partially dedicated to one or more client-groups.

In a dedicated network, the bridge may be on or off the premises, but the telephone lines are dedicated to the conference network on a 24-hour-a-day basis. Linkages are provided to predetermined sites (learning centres) where conference participants are automatically linked into the conference. Depending on the number of telephone ports available, a limited number of participants from other sites may also dial in to join selected conferences on an ad hoc basis.

There are two such dedicated systems in use, principally for educational purposes, in Atlantic Canada: one at Memorial University in St. John's, Newfoundland and one at Acadia University in Wolfville, Nova Scotia. Dial-up bridges for educational purposes are in use by the New Brunswick Health Association and the University of New Brunswick in Fredericton, New Brunswick, and at Dalhousie University and Mount Saint Vincent University in Halifax, Nova Scotia.

The dedicated system at MUN, consisting of a four-wire dedicated system, is the largest dedicated teleconference network in Canada. It is available 24 hours a day, seven days a week, and can be used to program up to four concurrent events involving any combination of sites in the different regions. Teleconference kits have been installed in all provincial hospitals, vocational schools, university campuses, a number of nursing stations and the offices of a variety of associated health and education agencies. Though the network's existing locations are fixed, new sites can be added.

As of 1985, 95 sites and 54 communities throughout Newfoundland and Labrador were linked to MUN's teleconference system. Conference participants who are not located at learning centres can also dial in from ordinary telephone locations. Four additional telephone lines are available for this type of dial-access. As well, other telephone bridges can be linked to the system, making possible Canada- wide, and even world-wide, multiple-site teleconferences. The MUN teleconference system may be used in association with two kinds of electronic imaging devices, the electrowriter and slow-scan television, both of which are transmitted on a narrowband or telephone channel.[5]

During the academic year, about 15 hours of programs are run on a Monday-Friday basis, and 6-8 hours are scheduled on weekends. Routine operations are between the hours of 0800-2200. From September 1, 1984 to August 31, 1985, 2,700 hours of programs were run. Outside the health user group, the greatest educational user is the School of Continuing Studies at MUN. Full teleconference courses are offered, as well as supplementary hours with correspondence and video courses. In the 1984-1985 academic year, 19 full courses were run, and 21 courses were planned for 1985-1986.

Fifty per cent of the programming is devoted to health users. In-service programs are sent to hospitals and nursing stations for physicians, nurses, nursing assistants, medical records clerks, secretarial staff, and hospital administrators. While most of these programs originate from MUN's faculties of medicine and nursing, some are provided by other networks and organizations such as, for example, the American Society of Clinical Pathologists in Chicago, the Royal College of Physicians and Surgeons in Ottawa, and the Canadian Hospital Association.

Administrative uses of the teleconference network principally consist of meetings. The district vocational schools use the network for the planning of their shared curriculum. As well, the network is used for meetings by a number of university faculties, the provincial Department of Education, the Newfoundland Department of Career Development, a few sub-groups of the Newfoundland Teachers' Association and school boards in Labrador.

Future plans for the teleconference network involve a link between an offshore oil rig and MUN's health sciences centre.[6] The implementation of this link awaits the installation of commercial telephone service between the rig and the mainland.

The second dedicated teleconference network in Atlantic Canada is at Acadia University in Wolfville, Nova Scotia.

In 1982-1983 a dial-up bridge loaned by Maritime Tel and Tel (MT&T) was used by Acadia University to supplement existing distance education activity at the university. The bridge was operated and scheduled out of Dalhousie University. In 1983-1984 Acadia obtained its own fully dedicated system.

The system at Acadia consists of a dedicated four-wire system, provided and maintained by Maritime Tel and Tel. The system links 11 communities in Nova Scotia. In the fall of 1985, the system was used 31.5 hours a week during the academic year and reached 150 students. Though the number of hours almost doubled from the previous year, the approach being used by Acadia is one 'step-wise' development.

Programming for the system is assured by the university's Office of Continuing Education. Several of the course offerings are supplemented by video programs seen at learning centres. Acadia has plans to increase the variety of delivery methods to include use of imaging technologies and increased use of videocassette recorders in the learning centres.

In addition to the MUN and Acadia systems, several other developments have occurred in the last five years. Early in 1982, through the efforts of the Atlantic Provinces Association of Continuing University Education (APACUE), MT&T in Nova Scotia and NBTel in New Brunswick were asked to provide audio-conferencing facilities in these two provinces. Two dial-up bridges were installed for use by Dalhousie University in Halifax and by UNB in Fredericton. Since obtaining the bridge, Dalhousie has used it for both administrative (especially meetings of such groups as the APACUE executive) and educational purposes. The bridge has also been used for special events such as conventions, national seminars, meetings or lectures by visiting scholars.[7]

A study conducted by Dalhousie University's Institute of Public Affairs in 1984 documents the system's utilization for two courses (Basic Accounting/Finance and Introduction to Business Administration). Other than this study, few current statistics are available that document use of this particular teleconference facility. One analysis of six months' use of the bridge showed there were 42 scheduled uses, of which 38 used three ports or more. There were 26 different users, 18 of whom were from Dalhousie University. Thirty per cent of this utilization was for teaching and the remainder was for meetings.

Plans are to increase utilization of the audio-conference system to make it more cost effective. A new office of distance education technology at Dalhousie is part of the division of continuing education, and efforts are being made by its director to disseminate information and provide assistance to faculty who wish to use the bridge for distance education purposes.

Mount Saint Vincent University (MSVU) in Halifax operates the Distance University Education via Television (DUET) system. The DUET program uses a studio-equipped classroom to transmit live, interactive credit and non-credit courses by television to distant learners. The courses are transmitted to a local urban clientele via Halifax and Dartmouth cable systems. For more distant learners, spread out over all four Atlantic provinces, the courses are carried on the Atlantic Satellite Network, a satellite-to-cable network which provides 20 hours of programming time per week to educational providers in Atlantic Canada.

Prior to the installation of a dial-up facility in 1984, live interactive participation was made available to students via collect calls patched into the studio-classroom. This allowed the distant learner's questions or comments to be heard by the instructor as well as the other learners in the studio-classroom.

The television classroom at MSVU is used by instructors both full- and part-time at the Mount, and by instructors from other institutions, such as Dalhousie University (School of Nursing), the Atlantic School of Technology (AST), and the Nova Scotia College of Art and Design.

Beginning in the fall of 1984, AST obtained funding for a teleconference system to be used in association with the DUET facility. A teleconference bridge was leased from MT&T for a trial period at that time. During the trial, the teleconference facility is available to all instructors using the DUET classrooms studio, to AAU committees and groups, and to other institutions as needed.

Future plans for use of the facility have not been disclosed, as the facility is still on loan from MT&T, and a study of existing and potential user patterns is still under way.

L'Université de Moncton has been involved in audio-teleconferencing since 1983-1984, when courses were first offered via teleconferencing to students in locations such as Shippegan and St. Louis de Kent, in New Brunswick. In September 1984, the Centre Universitaire de Moncton entered into an agreement with the University of Ottawa for courses originating in Ottawa to be received by teleconference at various N.B. locations. The first University of Ottawa courses were offered to francophone nurses in New Brunswick and later, courses were received for francophone teachers located in New Brunswick and Dartmouth, Nova Scotia. For the latter courses, students in Atlantic Canada registered with l'Université de Moncton, even though the course originated in Ottawa. Thus l'Université de Moncton was able to set up its own centres, recruit students, provide course credit to the distant learners and also obtain the equivalent course unit funding.

Though l'Université de Moncton does not own or lease a teleconference bridge on its own premises, the division of Education Permanente is expanding its distance education offerings. Using a bridge provided by NBTel, the division offers courses on the teaching of languages and in nursing and sociology. Since the fall of 1984, the university has also experimented with a combination of television programming and audio-conferencing.[8]

L'Université de Moncton has been successful in obtaining a number of grants to expand its work in distance education. It was through a grant offered by Canada Employment and Immigration that a team of producers was hired to prepare the television broadcast course. The university has obtained a grant from the Secretary of State which will permit a continuation of the agreement with the University of Ottawa, and the offering of additional courses of its own.[9]

Future use of audio-teleconference for distance teaching is entirely dependent on funding. The current projects are very costly. For those courses originating in Ottawa, there are high long distance charges incurred for course delivery from that distance.

The University of New Brunswick has been involved in audio-teleconferencing since 1980, when the technology was introduced as part of a regional strategy for collaborative audio-conferencing. Seven ports of an Interdaco 10-port bridge are used with Darome receivers at each of the receiving centres located throughout New Brunswick. The bridge is also used occasionally for meetings initiated by APACUE or by university departments other than the Department of Extension and Summer Session, which programs and schedules the teleconference facility.

The Interdaco bridge is owned and maintained by NBTel, but is dedicated for UNB use. There are approximately 20 Darome Kits for receiving centres, which are stored at UNB and sent out to the learning centres in New Brunswick.

The teleconference setup has occasionally been used in association with television broadcasts received from MPBN (Maine) or through ASN. The system has also been used with occasional video-conferenced seminars from U.S. locations. The university also used a freeze-frame imaging device on one occasion, as a pilot. A plan to share the facilities with l'Université de Moncton was dropped because of long distance charges.

In the fall 1985 semester, two credit courses were running (Biology and Sociology), each with large enrolments. In 1984, courses were offered in Biology, History and Nursing. Costs are relatively high. For example, bridge costs for 1984-1985 (September through May) totalled over $2,000.00. Long distance charges (the university dials out to the participating centres) totalled over $4,000.00. To these costs must be added those associated with the travel of the instructor (at least once to each participating learning centre throughout the province), costs of funding for staff involved in arranging the programs, costs of training instructors and producing and mailing out the materials. All these costs are standard for even a modest operation. In order to avoid deficits, the university concentrates on large enrolments.

UNB expects growth in the use of its audio-conferencing facility. In order to expand its course offerings, it is felt that a divisible bridge will be needed to permit the simultaneous offering of different courses to different learning centres.

The New Brunswick Health Association (NBHA) is another major teleconference course provider in New Brunswick.

The historical background to the introduction of teleconferencing in the New Brunswick health care system goes back to 1983 when teleconferencing was introduced in the province's Health Region III, an area approximately 240 km wide in the western part of the province. Eight hospitals participated for a trial period of five months from February to June 1983. Bridging services of NBTel and Darome receiving equipment were used at each site. Programs originated from the Everett Chalmers Hospital in Fredericton. Content was also received through arrangements with the Royal College of Physicians and Surgeons and from Memorial University's telemedicine centre.

The NBHA uses a bridge which has been assembled by connecting a number of six-port bridges together. A total of 22 ports is available on the system, which is maintained on site by NBTel. The bridge is fully dedicated to NBHA and scheduled by it. The bridge is used only about 25 per cent of the time (10 hours per week approximately) because of a lack of resources available to develop programs. Programs include content developed by the participating institutions and courses received from other agencies, associations, or course providers. If more resources were available for both programming and marketing, it is thought that use would increase dramatically. The bridge is also used to link into other audio-teleconferences offered by health associations across the country (e.g., the Alberta Hospital Association).

Future plans include assessing the needs of the participating institutions and locating suitable courses which can be delivered on the system.

Data Communications

Though elementary and secondary school systems have not adopted electronic communications on a large scale, networking between and within post-secondary research institutions has become well-established in Atlantic Canada, as it has elsewhere in North America and Europe. Some of the more significant developments which have occurred, or are planned, include the following:

1. The UNB Network is the oldest educational data network installation in the Atlantic region, having been in operation since 1970. This network includes the University of Prince Edward Island (UPEI), three campuses of l'Université de Moncton, Mount Allison, Saint Thomas University, and UNB. It operates on UNB's IBM 3081 system, using a number of access routes, including Datapac, cable and a dedicated line leased from NBTel.

   The UNB Network is used by both educational and non-educational users. Educational users use the computer for a range of services including shared computing, computer-assisted learning, text processing, electronic mail, administrative computing and data-base storage. Two recent applications are of interest: one is the establishment of an electronic bulletin board that is used to create an electronic newsletter composed by newsletter correspondents at various Atlantic universities;[10] the other is the implementation of a gateway to a network of Canadian universities, 'Netnorth', which in turn is linked to a large US network, "Bitnet".[11]

2. A second major initiative under way is a data network in the New Brunswick school system. In March 1985, 545 IBM-compatible machines were installed in 60 high schools, each with either 300 or 1200 bps modems for communications use. The applications are administrative: the schools are linked to the district offices and the computers are typically used for students tracking, record keeping and class ranks. By the end of the current year it is expected that all high schools will be linked to their district offices. Small districts are linked to the larger ones. Within two years, it is expected that all schools will be linked.

   In addition to this administrative network, the Department of Education has experimented over the past year with an electronic bulletin board, supported on a network of Commodore computers. This bulletin board is being used regularly by 250 users across the country, although only 5-10 per cent of this group can be said to be "hard core", daily users. The bulletin board houses information about conferences, jobs and educational resources. It also allows for private electronic communications. A francophone version is also available. Users of the bulletin board are mostly educators and teachers, two-thirds drawn from inside New Brunswick, and the rest from outside the province.[12]
3. By contrast to the New Brunswick situation, Prince Edward Island enjoys universal toll free access to Datapac from anywhere in the province. However, most schools there do not have computers with modems, and if they have modems, they often do not have telephone lines close to the computer's location. Most computers, therefore, are used on a stand-alone basis. Junior high schools, however, will all have modems and computers by June 1986. Half of the junior high schools already had modems as of early August 1985. Some school boards are linked, using dedicated lines. There is no central storage of data at this time. However, because of the universal Datapac access, prospects for inter-institutional networking are very good. Currently Envoy 100 is used for inter-library loan purposes in most libraries in Prince Edward Island, including public libraries which come under the Ministry of Education. The libraries also have a separate network for administrative purposes and have access to UTLAS on-line for cataloguing and reference purposes.
4. In Nova Scotia, there are no large scale data communications projects at the elementary and secondary schools levels, such as the ones identified above. At the post-secondary level, the largest network is the CAD/CAM (computer-aided design and

manufacturing) network at the Technical University of Nova Scotia (TUNS). There is also a number of local area electronic bulletin boards which are generally accessed by a wide variety of (not necessarily educational) users.

As in the other provinces, few of the 400+ schools in Nova Scotia have modems. School boards are judged to be the most likely future prospects for data communications for administrative record sharing and computing.

5. The CAD/CAM centre/network at TUNS is intended to encourage design and manufacturing industries in Nova Scotia to use CAD/CAM and related technologies in their production processes. The CAD/CAM network is used for a number of computer services including: design, data-base access, teaching, business applications and access to other services such as analysis for local businesses (done in Toronto). A variety of mainframe computers is also used: Prime, DEC-VAX, and Cyber. TUNS accesses the Dalhousie University CYBER computer for its statistical packages. The network is also used for accessing the Plato Computer-Assisted Instruction system.

   On-site users consist of 200 students and professors, who use a hard-wire network to access the mainframe computer. An extra line is being installed to permit access from another building which will increase the number of users by about 60. Off-campus users include about 33 private companies (as of July 1985), two universities (including Acadia which is linked by private leased line), six government departments (two federal, three provincial and one municipal), and four institutes and foundations.[13]

   Future prospects for the CAD/CAM network are associated with the implementation of a planned supercomputer in Nova Scotia and proposed networks to link industry and universities.

6. In addition to the provincial projects described above, a number of regional projects can also be identified. The electronic newsletter of the OEC has already been described as has the Netnorth/Bitnet network. Also a varied group of users has formed its own, sometimes informal, networks and/or makes use of a variety of external services such as electronic mail, bibliographic searches, computer conferencing, bulletin boards and commercial data-base services.[14]

In addition to Netnorth, a second research network, CDnet, implemented through UBC and a consortium of colleges and user groups called Consortel, has also recently been introduced in Atlantic Canada, through a link at

Memorial University where a VAX computer uses an X-400 protocol software to provide access to this distributed messaging network.[15]

Regional projects involving elementary and secondary schools include a national project which links school children in an international (kids-to-kids) network where they participate by signing-on to a large computer conferencing system housed at UBC and communicate with their counterparts in other parts of Canada and the world.[16]

Insurance Offices and Law Offices

Two recent studies[17] of insurance offices and microelectronic technology and law offices and microelectronic technology in the Halifax Metropolitan Area are also instructive for purposes of this micro-level discussion of the impact of telecommunications and computer services in the Atlantic provinces.

The study of insurance-related firms involved an investigation of the use of computers and word processors in 65 companies in the Halifax metropolitan area. Of the 65 companies, close to half were automated to some degree at the time of the study (summer 1984) and 80 per cent of the remainder expected to purchase or lease computer equipment within the next two years. If these expectations are realized, by mid-1986, 88 per cent of insurance-related offices in metro Halifax will be automated to some degree.

Interestingly, firms which were regional or local branch offices of national insurance companies tended to be linked via a communications network with a mainframe computer at the head office. Firms which were independent agencies were, on average, less automated and less likely to be part of a data communications network.

Close to 50 per cent of employers in the survey felt that automation had reduced their support staff requirements, while almost the same number felt there had been no change. Staff who were interviewed generally favoured the introduction of computers/word processors to the office and felt there was little change in skill requirements. Most indicated they spent about the same time on most of their job duties after automation as before and there were few differences in job satisfaction between employees in automated offices versus non-automated offices.

The law offices study examined the use of computers and word processors in 51 law firms in metro Halifax. This represented approximately half of the law firms in the area.

Most of the automation at present was found to be for word processing. Only 14 of the 51 firms surveyed were automated to any degree at the time of the study (fall 1983), but approximately 73 per cent of the remaining firms expected to introduce some level of automation within two years. If these expectations are realized, this will mean that 81 per cent of law firms in metro Halifax will be automated to some degree by 1986. Little or no networking was found to exist, except for local area networks where multiple work stations (terminals) were connected to a central processing unit.

There was definite evidence that larger firms (more than 15 persons) used fewer clerical staff per lawyer after automation. Overall staff positions, however, did not necessarily decline. Rather, there was a shift towards developing more paralegal positions and a subdividing of tasks among clerical workers. Small firms tended to show a more stable number of clerical staff and not to exhibit the tendency to paralegals or subdividing of task for clerical workers. Some changes in skill requirements were observed to occur, in particular a perception by clerical workers that training needs were higher with automation than without. Staff in automated offices generally supported the automation and overall job satisfaction tended to be largely independent of automation, except insofar as automation increased specialization of task, thereby reducing decision-making by employees which, in general, was seen as reducing job satisfaction.

Conclusions

The reviews of Process Technology Limited, Evans, Yeatman and Endal, Fishery Products International, the education sector and the brief discussion of the introduction of microelectronic technology in insurance offices and law offices lend support to a number of the hypotheses advanced by the theoretical framework set out in Chapter Three.

All three of the business firms examined serve a market which extends beyond their local area and, in general, is global in scope. All three firms rely heavily on telecommunications. Only one, however, FPI, the largest, engages in a substantial volume of data communications. None has yet tried much in the way of enhanced services such as teleconferencing or electronic mail. None makes use of external data base services, preferring to rely on more traditional print publication and personal contacts for market intelligence and more general information needs.

In general all three demonstrate the crucial role which a telecommunications capability plays for firms that operate on an export basis. They also demonstrate that attitudes are an important determinant of the extent of automation – telephone technology is most used because it is best known.

All three firms, as well as the education sector, also demonstrate the importance in data communications uses of equipment compatibility. Until their customers are automated or have compatible equipment, the use of messaging or other data communications services may not be viable. For the education sector, lack of compatibility may discourage networking.

PTL is of particular interest because it is both a high tech firm, of which there are relatively few in the Atlantic provinces, and because it is a footloose manufacturing firm in terms of its locational independence from transport costs. The fact that the firm's previous success may now be in jeopardy does not necessarily reflect on its Atlantic location. It is noteworthy, however, given our previous discussion of the importance of applications rather than production of the technology and the potential of a service sector focus versus a manufacturing sector focus. What is most important to recognize is that PTL could not possibly operate from the location it does without a high quality, reliable telecommunications network at its disposal. Whether it can survive even with this remains to be seen.

EYE and FPI are also noteworthy in their dependence on telecommunications. FPI, more than EYE, operates at a distance from its principal markets. Also as a large organization, vertically integrated from the harvesting stage through to final product marketing, the volume of information which it must process and the number of individuals and organizations that it must deal with in gathering and processing this information would probably be impossible in the absence of electronic communications and computers.

Interestingly, all three firms represent cases where rapid information flows are not perceived as particularly important, on average. In other words, the timeliness of information is not seen as an important consideration for these companies.

FPI and EYE also demonstrate the crucial role in telecommunications for intra-firm communications when there are multiple offices/plants in the corporation. PTL, as a single plant operation, does not evidence this characteristic to the same degree, although there is an element of it present in its dealings with its network of agents.

The education sector case demonstrates a great deal of activity taking place but also demonstrates the need for a great deal more study of the benefits and/or cost effectiveness of these activities. Most of the educational applications now occurring are pilot projects or are subsidized in some form, by carriers, equipment manufacturers, educational institutions or government. In many cases, the applications cannot directly support themselves financially and do not look as though they will in the foreseeable future. They do, however, clearly offer benefits in their ability to reach audiences which otherwise would be unserved. Memorial's network in Newfoundland and l'Université de Moncton's French-language offerings are particularly noteworthy in this regard. The geography and settlement patterns of Newfoundland make distance education offerings an almost unique way of reaching a relatively large number of people in remote Newfoundland communities. Similarly the dispersion of francophones throughout the Atlantic provinces makes l'Université de Moncton's network a unique way of delivering courses for francophones in the region. Interestingly, it is also a means for moving some primary production out of the region, in the form of the course offerings imported from the University of Ottawa.

Carrier network support for conferencing/networking activities appears to be an inhibiting factor in the growth of these activities in the education sector in the Atlantic provinces. In particular, the lack of nodes for the packet-switched network in many areas and the resulting need to use long distance dial-up (with consequent cost implications) is a definite obstacle to growth, even though the charges may not be excessive.[18] Also, the audio-conferencing equipment available from the carriers is of limited port capacity and usually not powerful enough to permit divisible programming. The solution to these problems, however, does not lie with the carriers, necessarily; rather it is a question of government policy and institutional support.

In institutional terms, distance education and networking are typically not viewed as mainstream activities of the university. This leaves the justification for, and the level of, institutional support very ambiguous. It is also reflected in a sometimes ambivalent commitment to these activities. It is probably not coincidental that the most highly utilized network is at the institution (Memorial) where the level of co-ordination and commitment to the effort is the greatest.

If educational applications are to grow, official institutional support must grow, both in terms of resources and in terms of commitment. In a time of significant budgetary pressures on universities, this will only happen on a large scale if the benefit and/or cost effectiveness of the technology can be shown.

The value of education, in both social and economic terms, is extremely difficult to measure. We can say with certainty, however, that education is an important element in the overall level of economic development of a region. Still, to demonstrate that electronic distance education activities are of net benefit to the region, work must be done which shows that electronic activities are either more beneficial than alternative delivery channels or that they are more cost effective than alternative delivery channels. For much of the present level of activity, a demonstration of either of these propositions has yet to take place, although some work in this direction has been initiated. Such work is crucial. In the longer run, the mere existence of the technology will not, by itself, provide a basis for maintaining and/or expanding educational applications. This is equally true for business applications.

Notes

1. PTL asserts that it has been told by NBTel that the delay in providing out-WATS service to the U.S. is because of the deregulation of the U.S. market which, in turn, is requiring a separate agreement to be negotiated by Telecom Canada, not directly by NBTel. It should be noted that Telecom Canada (and therefore all member companies, including NBTel) already has provision for a Canada-U.S. Bulk Service in a south to north direction.

2. The most commonly used site equipment of this type in Atlantic Canada is the "Darome Kit", which essentially consists of a speaker and a number of microphones connected to the telephone line as a substitute for using a telephone handset.

3. All of these add-on image transmissions can be accomplished using voice-grade telephone lines only.

4. Most audio-conferencing for instructional purposes is also accompanied by support materials to be used by distant students. Support materials may be used before, during or following lectures. Illustrations on overhead transparencies, slides, or in texts distributed as hand-out materials are sometimes used by telelecturers to augment the voice-only delivery system.

5. The electrowriter is used to transmit hand-drawn diagrams or notations during an audio-teleconference. The instructor writes on a small tablet and the images are seen by the learners on monitors installed at remote sites. Slow-scan television is used to transmit still photographic images of such things as medical charts and ECG and EEG tracings.

6. Previously tested during a trial period, the establishment of this link on a more permanent basis would permit personnel at the remote location to obtain medical advice and, possibly, to participate in other existing programs.

7. A 10-port Interdaco dial-up bridge is used, with 10 leased telephone lines, along with Darome kits for the users both on and off campus, and an array of other terminal devices such as the telephone company's Conference 2000 speaker used for meeting rooms. It allows for individuals or groups to

participate from 10 different telephone locations. It also permits the instructor/chairperson to call out from the bridge and have a separate conversation during the teleconference. Described as "fully automated", this system permits several disconnect options. An important limitation is that the audio level cannot be controlled. The level is pre-set and cannot be controlled by the chairperson in case of a lowered audio level on any one channel or port during a teleconference. A second limitation is that the number of ports cannot be expanded to bring in more than 10 locations. In order to expand the capacity of the present system by increasing the number of ports, during one trial teleconference two similar bridges were "linked", simply by have one bridge "call" the other, but voice loss was considerable.

8. Only one course is offered at present. Students receive the broadcast over the ASN cable channel at learning centres in New Brunswick (with one each also located in P.E.I. and N.S.) and, following the broadcast, use audio-teleconferencing to interact with the professor.

9. At present, nine hours of courses are being received through teleconferencing in a total of five centres. For 1986 nine course hours originating with l'Université de Moncton were planned. There is also a possibility of three courses from the University of Ottawa.

10. The electronic newsletter is a project of the office of Educational Communications of the Association of Atlantic Universities. A liaison person, or correspondent, from each participating institution inputs item of local news (i.e., from their own campus), while OEC staff provide items of a regional, national and international nature. Correspondents in the UNB Network use that network for access while others use Datapac. OEC contributes up to $25/month to communication charges and UNB provides free computing space and services. A usage manual and a help-line are available to users and a trainer was used to provide initial orientation to the system. Periodically, hard copy editions of the newsletter are produced for those who do not have on-line access. The newsletter was started in February 1985. It was scheduled for an evaluation in February 1986. Usage has been uneven, with some correspondents being regular users while others are infrequent or do not use it at all because of: lack of equipment, lack of a local Datapac node (which

increases long-distance calling charges), lack of computer experience or because they find the system cumbersome.

11. The Netnorth (-Bitnet/EARN) network is a large, predominately IBM hardware, network established for academic use in Canada (Netnorth) the U.S. (Bitnet) and Europe (EARN). It makes use of leased data lines in a store-and-forward networking arrangement. The Atlantic provinces gateway connection is through UNB. Initial costs for the dedicated link have been subsidized by IBM for a three-year period. Links to UNB exist at Memorial and, in Halifax, at Dalhousie. In turn, UNB is linked to the larger network through a connection to the University of Guelph which is tied to the network throughout North America. The European Academic Research Network (EARN) can also be accessed. In total, the network is made up of more than 500 machines at 200 U.S., 30 Canadian and 82 EARN sites. The introduction of the network in Atlantic Canada is too recent for any information on usage, etc. to be available. A comparative evaluation of usage patterns for a test group of users is currently under way, sponsored by the AAU's Office of Educational Communications , through funding provided by the Canadian Workplace Automation Research Centre.

12. It is felt that the system would be more useful, and more used, if it were capable of multi-use and multi-user applications. More important, the system is underutilized because of the number of teachers who are in locations remote from Datapac access, requiring a long-distance call to access the network. This makes the system too costly for many users. Perversely, this makes the system least accessible to those who probably need it the most – teachers in more remote areas.

13. For the off-site users, a number of data communications access routes are used. Because of this variety, MT&T has prepared a manual for users of the CAD/CAM system which describes the various local telephone services currently accessible to users. Future growth is expected in private line utilization and efforts are being made to increase hard wire access.

14. There is a rising awareness, amongst academics and researchers, of the benefits and cost effectiveness of electronic communications. One of the tangible expressions of this interest is the recent introduction of a network for research in

higher education called CHERN (Canadian Higher Education Research Network). It is proposed that CHERN act as the vehicle to permit joint electronic publications, exchange of research information, and the joint development of a data base of current Canadian work in this field. At least initially, CHERN will operate through the University of Guelph's COSY computer conferencing system.

15. The CDnet network is a distributed messaging network as compared to Netnorth which a leased-line network. These two systems will be compared in terms of user reactions in a study now under way through the OEC (see fn.11).

16. Two schools in each of the Atlantic provinces are linked into this network. The project was started in the summer of 1985. It is jointly sponsored by the Department of Communications (federal government) and the Inter-Provincial Association for Telematics in Education in Canada (IPATT).

17. Susan Clark, *et.al.*, "Law Offices and Micro-Technology in the Halifax Metropolitan Area", The Institute for the Study of Women, MSVU, April 1984; and Cara Flemming, "Insurance Offices and Micro-Technology in the Halifax Metropolitan Area", The Institute for the Study of Women, MSVU, August 1985.

18. NBTel presently provides toll-free dial-up for all areas of the province for users of Envoy 100 and iNet and is considering implementation of special rates for other data users. Newfoundland Tel provides a reduced toll rate for switched network access to Datapac which, currently, is set at $0.15 per minute.

Chapter 5:

Policy Implications

The preceding chapters of this study have reviewed the status of the economies and the telecommunications sector of the Atlantic provinces; developed a theoretical framework for assessing the impact of telecommunications on the spatial distribution of economic activity; and analyzed, both at a macro and a micro (case study) level, the implications of this theoretical framework for Atlantic Canada. In this chapter, building on the description and analysis of these previous chapters, we turn to consider the implication for regional development policy and telecommunications policy.

Requirements for An Information Industry

If it is taken as given that over the next several years, Canada will move progressively towards becoming an information economy, the question posed by this study is how will this affect the position of Canada's less advantaged regions? Putting the question more generally, what will be the impact or implications of the information economy on the spatial distribution of economic activity among Canada's regions? For the case of Canada's less advantaged regions this involves a consideration of the implications for present economic activities and the implications for new information-related activities.

The analysis to date has generated two overriding conclusions relevant to these questions: it is theoretically possible for disadvantaged regions either to gain or lose relative to more advantaged regions through the introduction/ application of the technology of the information age; and, given the present characteristics of the Atlantic economy, it is most likely that the Atlantic provinces will lose relative to other regions if market forces alone are left to decide the outcome.

The basis for this latter conclusion has already been documented in preceding chapters. The arguments include among others: smaller local markets; poorer, more expensive transportation systems; lower educational levels in the labour force; a lagging rate of diffusion of computers and of computer-based networking; and a relative lack of support facilities (maintenance, consultants, training) for computer installations.

Although there are some deficiencies in the availability of certain types of telecommunications services, especially in non-urban areas of the Atlantic region, these do not represent a significant impediment to the development of information-related/based activities in the region. The footloose character of most information-related activities means that these may well be located in Atlantic Canada. The conclusion that under present circumstances this is unlikely arises primarily from other than telecommunications network concerns. The conclusion that it is unlikely does not also mean it is impossible. Rather it becomes the task of government to alter circumstances so that it becomes possible. This involves attention to regional concerns at both the national informatics policy level and the regional development policy level.

National Policy

At the national level, current policy directions regarding the emerging information economy have been small and fragmented. Partly this is because, for the country as a whole, policy makers have not yet come to grips with the phenomenon of the information economy or the structural changes it will bring. Partly, it is because policy has been preoccupied with the question of producing the hardware of the information economy and has not focused sufficiently on the question of applying the technology. And partly it may be related to the traditional form of government organization and policy formulation which is along vertical sector lines, whereas the information sector is a horizontal one which cuts across these traditional vertical lines.

A national informatics policy is relevant to the question of regional impact because without a national policy framework within which to fit regional considerations, regional policies become more difficult to achieve or else run the risk of adopting misplaced or conflicting objectives. Thus it is relevant to examine more closely the factors just listed to explain the lack of a national policy.

The scope and depth of the changes likely to accompany the information economy are still not well understood by policy makers. In fairness, because the major impact is yet to come, there is still considerable debate over just what the implications might be. This uncertainty and/or differences of opinion notwithstanding, however, the policy community, both federally and provincially, has been slow to even recognize the issue. At the federal level, there has been a marked tendency to regard the information economy as a peripheral concern to the mainstream activities of the various ministries and agencies of the federal government.[1] The result has been very small efforts to come to grips with the issues or to promote applications of the technology. Moreover, these small efforts have been fragmented and relatively unco-ordinated. Until there is greater recognition of the importance of the phenomenon, these problems will not be solved.

Beyond this recognition problem is the need for concrete policies at the national level which not only promote the trend towards the information economy in positive terms but also develop appropriate policies to deal with the dislocation effects the widespread introduction of the technology is likely to cause. This involves such things as training programs to produce workers with the skills required by information activities, as well as to provide the retraining needs of workers who may be displaced by the technology; policies to deal with the issue of trans-border data flows; legislation/policies to deal with such issues as copyright protection for software and on-line data bases and privacy concerns; policies regarding the importation of hardware (e.g., computers, telecommunications equipment), in particular the imposition of excise taxes and sales tax on such items;[2] policies regarding vertical integration/market structure for computer-communications services markets, including the issue of the role of carriers; and so on.

These examples are just illustrations of what is, in fact, a very long list of policy concerns which needs to be addressed nationally. It is a list which, so far, has received only fragmentary, small-scale attention.

There has been a somewhat more concerted effort in promoting the manufacture of the equipment (hardware) of the information economy. Insofar as Canada can efficiently compete in the hardware manufacture market with other countries, this is good. But government efforts to promote hardware manufacture have had two major problems: they have not been based on any empirical demonstration of the viability of Canadian hardware production, across the board versus individual firms; and the focus on hardware has been at the expense of an emphasis on applications.

Videotex services represent a good illustration of this problem, as seen in the now defunct Telidon Program, which was operated by the federal government from 1979 to 1984-1985. This program spent $67 million on a series of field trials and related activities ostensibly aimed at the development of a videotex market using the Canadian-developed Telidon technology. Sixty-seven million dollars and six years later, there were fewer than 5,000 Telidon terminals in use in Canada. A major part of the explanation for this outcome is that the program was hardware oriented rather than market/applications oriented. A great deal of money and effort, relatively speaking, went to manufacturers of Telidon terminals, either directly or indirectly. Very little attention or money, in relative terms, went into content/applications development. For the most part, the content base for the field trials involved only information retrieval and most of that was of the standard weather, news, entertainment variety. There was no attempt to test other functional applications of the technology such as transactions (tele-shopping, tele-banking, etc.). There were no commercial trials and hence no testing of alternative pricing schemes or pricing structures.[3]

One of the reasons for the preoccupation of government with hardware, of which the Telidon Program is just one example, may well be that hardware manufacture has more political appeal. Machines are tangible products that can be seen. They are produced in plants that are visible. They represent goods for trade purposes. These are all qualities that are politically attractive. Software and services based on the technology are much more intangible. They are also likely to be dominated more by small and medium-sized businesses, which makes them less spectacular on a firm by firm basis than large manufacturing plants.

In addition to this, however, the hardware focus reflects the traditional attitude that manufacturing growth is the key to economic growth. In other words, it reflects a lack of understanding by policy makers of the relatively greater importance of applications of the technology versus manufacture of the technology for an information economy. The distinctiveness of the information economy lies in the way the technology is applied, not the production of the technology. Recognition of this difference between hardware production and applications has been slow to develop.

Finally, there has been no single co-ordinating agency at the federal level responsible for dealing with the issues of the information economy. Governments, traditionally, have been organized along vertical sector lines in the make-up of departments or ministries (agriculture, fishing, manufacturing (industry), trade, etc.). Information activities, however, are a horizontal phenomenon which cuts across all the vertical sectors of the economy.

The lack of a co-ordinating agency, or a single agency charged with responsibility for information-based activities, coupled with the traditional sectoral split of the public sector, are major factors in explaining the relatively modest and fragmented set of government informatics policies and programs now in place. It not only makes the efforts more fragmented and modest for a given overall commitment of resources, but may also produce duplication and, at times, conflicting policies. The Department of Communications, for example, operated a major office automation experiment from 1984 to 1986, in co-operation with a number of federal departments. In the meantime, most federal departments not part of this experiment were busily engaged in buying office automation equipment which was not always compatible with the equipment purchased by others and often was not utilized in a manner consistent with the official trial experience. At the same time, industrial grants were being handed out by DRIE for manufacture of equipment which was different again from that being purchased by the government for its own use.

The lack of a well-defined, co-ordinated, and integrated informatics policy at the federal level makes the task of developing such policies at a provincial or regional level more difficult. For one thing, many of the policies fall under areas of federal constitutional jurisdiction and cannot be directly acted on by the provinces. Beyond this, the lack of a national framework promotes a more piecemeal approach at the regional/provincial level. Most importantly, it leaves major policy initiatives beyond the scope of many of the relatively poorer areas such as the Atlantic provinces.

The two provincial governments which, relatively, have done the most in terms of information economy-related issues are Ontario and Quebec. Both are better able to afford such initiatives than are poorer provinces such as those in the Atlantic region. In both Ontario and Quebec the overwhelming emphasis, however, has been on high-tech production, although Quebec has put considerable emphasis on the development of a software industry. While a hardware emphasis may be more warranted in Quebec and Ontario than in other parts of the country, it still remains to be seen whether most of these manufacturing enterprises will survive in the longer run, without either direct or indirect government assistance. Moreover, even in Ontario and Quebec, the relative policy emphasis on hardware manufacture may be misplaced compared to greater emphasis on applications, the same problem as was noted just above for the federal government.

In the Atlantic provinces there is even less basis for believing that there is any comparative advantage in hardware manufacture. The region suffers the same general locational disadvantages in manufacturing high-tech as it does in the manufacturing sector in general. While it is true, as argued in Chapter Three, that the technology of the information economy may reduce the minimum efficient size of manufacturing firms, thus working to the advantage of relatively smaller and poorer regions where small and medium-sized firms are more dominant, the local Atlantic market is still too small for these smaller economies to make much difference. This leaves such firms dependent on export markets where all the traditional disadvantages of transportation costs, etc. still apply.

The utilization of communications and computer-communications technology in the marketing, distribution and service functions may help traditional manufacturers as well as high-tech manufacturers in the Atlantic provinces by facilitating a widening of the market area that they can serve efficiently. But the sector of the economy best positioned to capitalize on this potential is the service sector.

Regardless of the sectors involved, however, much of the resources necessary to promote these results in Canada's relatively poorer regions must come from the federal government. Until the federal government has a national informatics policy in place and has a federal agency charged with the responsibility for implementing this policy, whether directly or through a co-ordinating role in dealing with the traditional line departments, the necessary federal resources are not likely to be forthcoming in an appropriate manner and in an appropriate amount.

As a footnote to this discussion of federal policy, it should be noted that one area in which most provinces, at least *de facto*, exercise jurisdiction is telecommunications. This is an area where, for the most part, the provinces have done little in relation to recognizing and acting on the telecommunications needs of the information economy. If the political will, the recognition of telecommunications as important to economic development, and the necessary policy expertise were all present at the provincial level, a great deal might be done to encourage increased and appropriate applications of telecommunications without reference to the federal government. While it may be hard for the provinces to act in a co-ordinated, across-the-board fashion without a national policy framework in place, this is not an excuse for total inaction. Both levels of government can and should do more.

Regional Development Policy

Regional development policy is a major delivery vehicle for federally-funded development initiatives in the provinces. Traditionally, it has focused on the goods-producing sector, both the primary (natural resources) and secondary (manufacturing) sectors and on infrastructure development. Relatively little attention has been paid to the service sector.

This point is important because the service sector has been the fastest growing segment of the labour force since the 1920s. Moreover, the service sector contains the majority of information workers. Nationally the service sector now accounts for 60 per cent of the employed labour force, and the information sector represents close to 50 per cent of national employment.[4]

A simple and straightforward recommendation for regional development policy, therefore, is to place a greater emphasis on service sector activities, particularly those that are information-intensive. This, however, will require a basic change in the mind-set which equates growth and industrialization. The post-industrial information economy calls for new ways of looking at regional development policy.

Beginning in the late 1960s and continuing through the 1970s, regional development policy also placed considerable emphasis on infrastructure development in less developed regions. The telecommunications sector, however, has never been included in the infrastructure areas receiving support. In part this may have been due to the perception that the telephone system was already well-developed in the less developed provinces and on a par with the country as a whole. In other words, there may have been no perceived need to build up the telecommunications network in the way it was felt to be necessary to build roads or airports or provide serviced land development for industrial parks, etc.

The telecommunications network, however, is not equivalent through all sub-regions of the Atlantic provinces. In particular, rural areas may experience lower levels of service than urban areas in a number of important respects. While this is equally true of rural areas in all provinces, it is relatively more important in the less developed provinces, since these also tend to be the less urbanized provinces. Thus it may have been desirable to include telecommunications network development assistance for rural areas under the General Development Agreements (GDAs), which were the major explicit regional development vehicles between Ottawa and the provinces through the 1970s. In actual fact, no GDA in the Atlantic region in the 1970s included any telecommunications network development in the infrastructure packages provided.

The reason for qualifying this conclusion by saying "may" is the carrier policy of providing service on demand. This means that where the needs of a business in a rural or remote area cannot be provided by the already installed network facilities in the local area, the carriers will provision a special plant to provide the company with the service it needs. For example, MT&T recently installed a microwave radio system to provide the Rio-Algom tin mine in Yarmouth County with the particular voice and data services Rio-Algom required.

Thus it is fairly safe to say that no company wishing to locate in the Atlantic provinces, and requiring a telecommunications capability not already available in the location site, was unable to obtain what it wanted through special arrangements with the carriers. On this basis, regional development policy makers might well claim that there has been no need to divert funds to telecommunications infrastructure development because needs can and will be met through the market. This response has problems, however.

First, although the carriers do respond, they have first to be asked. This brings us right back to the recognition problem. If the regional development policy makers responsible for negotiations with firms potentially interested in an Atlantic location do not recognize the role of telecommunications for the firm, the ability to get the system required may not be put on the negotiating table. The business firms, for their part, may not perceive it to be an item to put on the agenda but may weigh the inability of already installed capacity to handle their needs as a significant (negative) factor in making their final location decision. Other companies may identify deficiencies in the present system's ability to satisfy their needs and not even get to the negotiating stage for this reason. It is not possible to document these types of missed opportunities but the possibility is a very real one.

Second, while special accommodation of users' needs can be provided by the companies, this implies, in the words of an official of MT&T, implementing "the necessary technology in a financially responsible manner". In other words, the user may have to pay or may have to wait. This, of course, is the normal situation in any market economy and, on the surface, may not be objectionable particularly given that it will normally apply only to so-called "special assembles". But other infrastructure items are not necessarily treated in this way. Development agreements between Ottawa and the provinces regularly include provision for such things as serviced land development for industrial parks, highway upgrading or provision of railroad spur/branch lines to particular locations such as industrial parks. Not only does this assure availability when firms are being sought to locate in these areas or when firms, on their own, are looking for suitable location sites, but it also means that the capital cost of such facilities does not act as a deterrent. The failure to include telecommunications plant provision in either general development packages or individual firm arrangements may well be a deterrent for many companies, especially small and medium-sized firms.

The final point to note regarding the case for telecommunications infrastructure development being included in regional development agreements is a point made by Amin and Goddard:

> . . . in the context of the information technology revolution, a lack of demand for telecommunications services *arising from a failure to use the ability of this technology to provide access to an international store of technological knowledge* may lead to an under-investment in the infrastructure that is likely to be a necessary condition for the next upswing.[5]

In other words, a service on demand approach works only so long as the demand actually emerging in the market reflects the true underlying need for the technology. In such a situation, the network may be continuously undersized. None of these arguments is meant to suggest that greater telecommunications infrastructure investment alone is a sufficient condition for greater economic growth in less developed regions. But it may be an important factor. A strong analogy can be drawn between the arguments of the past which supported government building of highways in advance of demand and the case of telecommunications infrastructure which might properly be regarded as the highway of the information age.

In addition to the issue of network development assistance, telecommunications costs may also be relevant. Previous parts of this study have argued that many information activities are footloose, in the sense that so long as adequate telecommunications facilities/services are available, the activities can, in a technical sense, be located anywhere. The actual location decision for such footloose activities may, however, be influenced by a number of economic and/or non-technological factors such as the availability of a trained labour force, the adequacy of transportation infrastructure, the availability of social/cultural amenities for employees, and so on. Among the relevant economic variables may be the cost of communications, which, at least with terrestrial-based networks, are not distance independent. To illustrate this point, consider the case of a data processing centre set up by a major Canadian bank, an example of a footloose activity used in Chapter Three.

This data processing centre will be footloose in the sense that, with appropriate telecommunications links to all input and output points, the computer facility and all of its support services can technically be anywhere. Depending on the particular pattern and volume of traffic flows, however, the communications costs associated with one site may be more cost effective than those of another site. For most national banks, the largest concentration of customers is likely to be in Quebec and Ontario. Hence it is reasonable to infer that the largest volume of on-line transactions will take place in these provinces. The location of the bank's data processing centre in this region will thus minimize the communications cost component for this largest concentration of traffic. Beyond this, a location in the middle (approximately) of the country will reduce the communications cost per transaction of going either east or west versus the cost of going across the country from a location at either end.

To estimate the actual extent of these potential communications cost savings would require an investigation of the data processing operations of an actual bank, including a detailed traffic analysis. This is beyond the scope of this study. Thus we cannot say how large this difference may be. Given that the bank would probably be using leased data lines between all major traffic points, this would significantly reduce any cost differential that might exist on the basis of standard long distance rates on public access data network charges.

The general point, however, is that communications costs are likely to be higher for a firm serving the national market from a position at either end of the country versus a location in the middle, particularly in view of the concentration of population in the middle.

Differential communications costs for communications-intensive firms are not, however, a factor to which policy makers appear to have paid any attention. Nor, more generally, has there been a recognition of the importance of the regional structure of telecommunications prices. Where communications cost differences otherwise pose an obstacle to certain firms or activities locating in a periphery region, some government subsidization of these costs (whether directly or indirectly) may be in order.

This last point is of particular interest to the question of the regional implications of greater carrier competition.

Competition is generally perceived as likely to lower long distance calling rates. Thus, insofar as communications cost differences may deter certain firms from choosing an Atlantic location, competition may address this problem by reducing the cost of toll services. But such a reduction would be across the board, would apply to both incoming and outgoing calls, and would probably require a raising of local calling rates in order to protect the financial position of local monopoly carriers. As noted in the section below, which deals further with the competition issue, these changes would not necessarily be in the interest of Atlantic Canada. Selective subsidization of communications costs for certain firms locating in Atlantic Canada might be a better option because it would be selective and therefore less expensive; it would be for originating, i.e., out going calls only, thereby continuing to offer some protection to local firms from outside competitors who might otherwise use the technology to better penetrate the Atlantic market; and it would be funded by government versus carriers and, therefore, would have no major implications for local calling rates. It should be noted that this is precisely the policy that has existed for railroad freight rates in Atlantic Canada since 1927.[6]

One further point should be made with respect to infrastructure development as an integral part of regional development policy. The telecommunications network is only one part, albeit an important part, of the infrastructure of the information economy. Also part of this infrastructure are computers and computer support services (maintenance, consultants, training, etc.). As noted in Chapters Two and Three, the rate of diffusion of computers and computer support services in Atlantic Canada has lagged behind the country as a whole. There is a clear need to accelerate this rate of diffusion in Atlantic Canada.

Networking of computers is another area where Atlantic Canada is lagging behind the country as a whole. The insurance company example of Chapter Four noted that it was only the branch offices of national insurance firms which were at present networked. The Economic Council of Canada, in its 1979 study of the Newfoundland economy, observed that national firms are more likely to adopt new technology and to do so more quickly than local firms. Other examples in Chapter Four – Halifax law offices, Process Technology Limited, Evans, Yeatman and Endal and Fishery Products International – also illustrate the lack of networking. Only FPI is involved in significant networking, both with its processing plants in Newfoundland and with its processing plant and marketing division in the U.S. All of this, however, is internal to the company; there is no external networking. PTL has a single link to one researcher for one project. None of the law offices was networked as of 1984. EYE is linked to the CAD/CAM machine at TUNS and to the CYBER, but these are local and/or minor applications of networking. None of the firms subscribes to electronic mail or to electronic data base services. The education sector clearly involves networking but, so far, most of this is local – participation in national/ international networking (Netnorth, CDnet, etc.) is just beginning to emerge. So too is inter-provincial networking within the region. Most of the in-province networking, with some notable exceptions such as the teleconferencing network at Memorial, is still at the experimental or trial stage. While none of these examples is definitive, they all confirm the general observation that networking is not that advanced in Atlantic Canada. It is another area where an acceleration of development is called for.

This discussion of regional development policy has focused on the need for greater attention to service sector activities in general and information sector activities in particular; the need to recognize telecommunications network development as an important part of the region's infrastructure and to consider network development for funding support; the need to pay closer attention to communications costs as a locational determinant for certain firms and to develop policies appropriate to dealing with this problem; and the need to promote greater and more rapid diffusion of computers, computer support services and networking, all of which are basic parts of the infrastructure of the information economy. In general, then, this section has emphasized the technical infrastructure support necessary to promote information activities in Atlantic Canada and the need to focus directly on information-intensive service firms. The policy actions arising from these recommendations differ in focus, not in type, from present regional development policy. The current policy includes infrastructure development and location/expansion incentives for goods-producing firms. What is needed is a redirection of these programs to emphasize information-intensive firms and the infrastructure support required by such firms.

Other Policy Issues

Education

The successful launching of a major information-based sector of economic activity in the Atlantic provinces will depend, *inter alia*, on the availability of workers with appropriate training and skills. In turn, the availability of such workers will depend to a large degree on the availability of appropriate training programs and institutions.

The Atlantic provinces have a strong educational infrastructure already in place. But, as the data of Chapter Two showed, average levels of educational attainment in the Atlantic region are still below the national average. Data on specific types of programs of the kind most relevant to the labour force needs of information activities are not readily available. Moreover, the range of training needs in question covers a very broad range of skills and levels of educational attainment. It ranges from management and marketing personnel, scientists and researchers, computer programmers and software developers, all the way down through the spectrum to keyboard operators.

The use of the technology by the education sector for program delivery, as described in Chapter Four, is not the issue here, although these educational applications of the technology might prove beneficial as delivery channels for the training needs in question. It is the workers to perform the tasks required by the information sector that is at issue.

Some firms will be in a position to provide their own training needs in-house. But the ability to do this will still be contingent on these firms having access to a labour pool of persons with a level of educational attainment which allows them to take up this in-house training. Beyond this, however, is the fact that, for small and medium-sized businesses, in-house training may not be financially viable either because of high fixed costs both in total and in per capita terms, or because the training requirements are "once-off", subject to the rate of labour turnover experienced.

The role for government(s), thus, is twofold: first, to provide programming of a more general, generic type which ensures a pool of labour capable of being trained to the more specific needs of individual companies; and second, to promote the availability of more specific offerings to serve the needs of (particularly smaller) firms which cannot operate in-house training programs of their own. The latter type of program might be done through public educational institutions such as technology/vocational schools or through government sponsorship or encouragement of offerings at universities or through appropriate efforts to establish commercial training institutions. Any of these would be able to achieve lower unit (per participant) costs than individual in-house programs by spreading the high fixed costs over a larger audience and would solve the "once-off" problem by being able to repeat offerings for different companies.

As microelectronic technology leads increasingly to automation of the workplace in all sectors of the economy, it has been predicted by some observers that the major job growth will begin to shift towards relatively low skill, low paying manual type jobs such as cleaning/maintenance work, waiter/waitresses, messengers, etc.[7] While these predictions have considerable validity, they do not preclude the possibility of certain parts of the country maintaining higher than average rates of growth in higher skill, higher paying jobs of the type already discussed in this section. To be such a region, however, will require, among other things, a skilled labour force on which to build a focus of economic activities that will maintain/create such employment. Education, in this context, becomes even more important.

Further, however, is the fact that without education to provide a skilled labour pool, various areas of the country will increasingly find themselves part of this de-skilling trend. For already less advantaged regions to be caught in this de-skilling trend will further exacerbate existing income and job disparities and/or create a more skewed income distribution as a relative loss of higher paying jobs is experienced.

Whether Atlantic Canada can escape, or will fall victim to, this de-skilling trend is an important issue. The region's present situation of a less well-educated, less skilled labour force clearly represents an initial disadvantage. On the other hand, an early recognition of the problem and concrete steps to overcome it could reduce this initial disadvantage considerably, if not eliminate it altogether. At the very least, steps must be taken to ensure that the region does not experience this de-skilling disproportionately to other regions. General education and training and retraining programs supported by government will be crucial to this result.

Technology Diffusion

There has already been some discussion of the importance of promoting greater and more rapid diffusion of the technology of the information economy. This is a point important enough to deserve more attention.

A major role government can play in promoting technological diffusion in regions that tend to lag in the diffusion process is to provide information and counselling on technological developments to business people in these regions. In many ways, this is another type of education: "training" individuals as to the opportunities available.

This is not a trivial point. A major reason for lags in diffusion is frequently ignorance or uncertainty. Firms in isolated regions, particularly small firms, may not be in a position, on their own, to know of the latest developments or to recognize what these developments mean or how they can be used.

Governments, both federal and provincial, already operate a variety of "help" programs for business, in areas such as management, marketing, accounting, labour relations, etc. What is needed is to extend these models to include the technology (and related areas) of the information sector with a staff of professionals whose jobs it is to be on top of what is going on, who suppliers are, what applications are possible, and so on.

Beyond this education/information/counselling role, governments can play other roles in aiding technological diffusion. For example, the Nova Scotia government and the federal government in 1984 signed a $34 million technology transfer agreement. This agreement has provision for helping industry and institutions to catch up to other parts of the country in the use of CAD/CAM and other microelectronic developments and for a supercomputer installation to be established in the province.

This agreement provides an illustration of two important points: first, it is a prime example of an attempt at promoting a more rapid diffusion of technology; second, it reflects a continuing major emphasis by government on the industrial sector. The first point is an important one but self-evident in the context of this discussion; no more needs to be said on this. The second point, however, merits further comment.

There is nothing wrong in looking for, and promoting, industrial applications of new technology. Indeed, it was pointed out in Chapter Three that applications of the technology for existing industry in the Atlantic provinces was a potential source of major benefit. But the fact that the focus of the agreement is so fully aimed at production processes and does not pay any particular attention to the technology as a marketing tool or to service sector information-based activities reflects the lack of recognition of the potential in these areas noted earlier in this chapter.

A further area where government may play a role in diffusion is in providing or helping to provide shared facilities for use by small and medium-sized businesses, which otherwise may not be able to afford or justify, on the basis of volume of use, hardware installations of their own. Some of this is already happening with such initiatives as, for example, a province-wide CAD/CAM facility in New Brunswick and similar efforts in Nova Scotia through facilities at the Technical University of Nova Scotia. Other examples of sharing in the education sector, both in-province and on a regional basis, were noted in the education sector discussion of Chapter Four. More of these sharing arrangements, however, are called for if most Atlantic businesses are to make use of the technology in an optimum way. Government has a role to play not only as a source of information and advice on availability and applications, but also where appropriate, in provision of the facilities themselves.[8]

Promoting A Favourable Climate

In addition to aiding the diffusion of information technology in the Atlantic region, governments also have a general role to play in fostering a more competitive position for Atlantic businesses. As previous discussion (Chapter Three) has pointed out, the primary question of the regional distribution of the benefits from the growth of information activities in Canada still exists after all regions have comparable telecommunications technology in place or available. Indeed, the technology itself may be the primary instrument permitting a greater centralization of economic activity.

The answer to this centralization danger for less developed regions is not a Luddite-type solution of trying to stem the tide of technological change. Even if this were possible, which in the long run it is not, it would not be in the long-run interest of any region to attempt to do so. But it is very important not to see diffusion alone as solving the problem, a view which has been common to the general question of technological change and regional development in the work of the Economic Council of Canada and, more recently, the Macdonald Royal Commission.[9]

In the long run, the technology must not be in place but it must be used in ways that make an Atlantic Canada location more competitive in the Canadian market and/or in foreign markets. This will involve, in part, policies of the type already referred to: shared computing facilities, small and medium-size business applications, greater attention to networking, incentive packages for attracting footloose information activities, and so on. It will also mean providing a climate favourable to information-related activities. This means making sure that telecommunications infrastructure is of a quality commensurate with other locations in Canada, being able to offer a labour force with the right skill mix and training and, perhaps, offering a preferential set of telecommunications prices to Atlantic producers. It also means fostering research and development activity aimed at new applications of the technology. It is not enough to promote diffusion of new technology to eliminate present lags. To be at the forefront of the development of an information economy in Canada, the Atlantic provinces must *lead* in technological applications.

The supercomputer installation in Nova Scotia, referred to above, is a good illustration for this point. If the supercomputer facility had been approved when it was first proposed, it would have been one of the first such installation in Canada. More than two years passed, however, without any decision to proceed with this facility. Meanwhile, at least five other supercomputers were installed elsewhere in Canada. Much of the delay in Nova Scotia was because the provincial government could not decide if the province needed or wanted a supercomputer or where in the province it should go. This delay meant the loss of the benefits that could have come from being first. Such a delay is not indicative of the kind of climate or general environment the province/region must demonstrate to potential investors if it is to assume a leading role in this field. Nova Scotia missed a chance to show the rest of the country, indeed the world, that it can be a risk-taker. In the rapidly changing world of technology in which we now live, this is a crucial aspect of the climate which must be created if information technology intensive firms are to be induced to locate in the Atlantic provinces.

A recent survey of computer and/or communications firms in the Ottawa region discloses some interesting statistics regarding the characteristics of the software companies which have made Ottawa a centre of high-tech development in Canada:

1. 154 software firms are now located in Ottawa, 124 of which were counted in the survey.
2. 4,500 people are employed by these firms in the Ottawa region; 1,700 of these are engaged directly in software development.
3. 55 per cent of the firms counted had 15 full-time employees or less; only five companies had more than 150 employees.

4. The largest firms, in terms of sales, were major export firms.[10]

These figures illustrate the tendency to agglomeration, the local employment benefits, the preponderance of small and medium-sized businesses and the importance of exports to growth for information-intensive firms. These are all characteristics which have been commented on in the preceding discussion of this report.

More importantly, these statistics, and the survey from which they come, underline the importance of the general environment of a given location in successfully attracting the firms of the information economy. It is even instructive that the survey itself was commissioned by the Ottawa-Carleton Economic Development Corporation. It is not just provincial governments (with or without federal assistance) that have a role to play in promoting a favourable climate for information-industry firms. It is also municipal governments and other community-based groups.

Telecommunications Policy

Reference has already been made to the need to recognize telecommunications plant and services as part of the infrastructure of the information economy and to the possibility of instituting selective subsidies of the telecommunications costs of firms located in Atlantic Canada. We have not yet, however, talked in detail about the issue of carrier competition, which is one of the major issues on the telecommunications policy agenda in Canada today.

Based on the analysis of this study, there is no clear-cut answer to the question of the desirability of carrier competition in the telecommunications sector for less advantaged regions.

There is no question that technological advances in telecommunications have made competition possible and, some might argue, inevitable. Such competition, however, will almost certainly be confined, initially, to long-haul traffic, i.e., to the long distance or toll market. In turn, this will almost certainly mean higher local calling rates/charges, higher rates for rural areas and, perhaps, higher rates overall for smaller, less densely populated regions. Less advantaged regions such as the Atlantic provinces stand to lose, relatively, on all these accounts.

Insofar as carrier competition leads to a lowering of toll rates, firms in Atlantic Canada doing business outside the region will gain. Much emphasis has been placed in this study on the way in which information technology may improve the competition position of Atlantic firms, allowing them to widen their market area beyond the region, and make the Atlantic region a feasible location for information activities intended for national/international markets. Lower long distance charges would definitely aid these effects.

Competition is likely, however, to be selective both in terms of the locations covered by alternative carriers and the services for which they compete. The present monopoly carriers will still have the legally/politically imposed responsibility for providing services in all areas and of all types. Essentially, the locations and services where competition emerges will be those which are the most lucrative. No one is going to duplicate local service offerings because, among other reasons, duplicating the local switching/transmission plant of the present monopoly carriers would be prohibitively costly. If interconnection to the local switched network of the monopoly carriers can be obtained, however, competitive toll service for major urban centres are certain to emerge. Indeed CNCP has already sought approval from the CRTC for such a competitive service.[11]

The implication of such selective competition, particularly if interconnection to the monopoly carriers' local switched network can be achieved at relatively low access charges, will be a loss of revenue for the present monopoly carrier, assuming nothing else changes. To recover this loss in revenue, the monopoly carrier will be forced to raise prices on non-competitive services and in non-competitive locations. Quality of service in non-competitive areas/locations could also suffer as network investment becomes increasingly concentrated in the more competitive high-traffic routes.

At present it is generally conceded that there is a cross-subsidization of local calling service by toll service and of rural areas by the urban areas. Implicitly, this also means that high-volume toll users are cross-subsidizing low-volume toll users.

With carrier competition in the toll market, all these cross-subsidies could be eliminated. The Atlantic provinces, which have a lower level of urbanization than the country as a whole and a higher percentage of small and medium-sized businesses which, on average, are relatively smaller users of the toll network than large firms, will suffer disproportionate losses from the combination of lower toll/higher local prices. Moreover, as previously noted, there are no guarantees that the region will gain offsetting benefits as a result of Atlantic firms being able to take advantage of the lower long distance rates. Lower rates which result from competitive pressures will work in both directions and may just as easily help non-Atlantic firms better to penetrate Atlantic markets as the reverse.

Even if the relevant regulatory bodies in Atlantic Canada decide not to allow competitive services to operate in any or all of the Atlantic provinces, competitive services in the federally regulated areas of Ontario, Quebec and British Columbia, areas which account for approximately 74 per cent of total toll traffic at the present time, will still have major implications for Atlantic carriers. The revenue sharing arrangement now managed by Telecom Canada will necessarily be affected by any significant decline in the "revenue pot" of Telecom Canada members, particularly Bell Canada. Thus the regional implications of competition is a matter of national policy, not just provincial policies.

Long distance rates may be lowered and local rates raised even without competition. Several telephone companies in Canada have begun to talk about "rate rebalancing", a move which may be prompted by a desire to forestall competition. If toll rates can be lowered sufficiently, potential competitors in the toll market may no longer view entry to the market as desirable.

Insofar as Atlantic firms making significant use of telecommunications for contacts outside the region would benefit from !ower toll rates, there is probably no difference between lower rates which come about because of competition and lower rates which are a consequence of rate rebalancing without competition. This is the view expressed by Process Technology Limited, for example, in the discussion in Chapter Four.

One might still argue that competition would be superior on the grounds that it would provide users with a choice of carrier, which could mean an increase in the quality of service and, in the long run, offer greater assurance that toll rates were as low as possible.

The latter argument is not a particularly strong one if rate rebalancing aims to lower long distance rates to the point where rates are prohibitively low for entry to the market. Unless they stay at this level, the pressures for entry will simply re-emerge. The quality argument may be valid. But quality has been less of a major source of complaint in the present monopoly system than price. Some users have expressed concerns over the inability to use certain types of terminal equipment or to have their calling needs configured in desired ways. But, given the present plans of Telecom Canada member companies to implement ISDN by just after the year 2000, most of these complaints, however valid in the past, will be of less concern in the future insofar as they are at present a function of technical characteristics of the network. Insofar as they are a function of a lack of appropriate marketing by the monopoly carriers or a complacency borne of carriers' monopoly position, the problem needs to be addressed in other ways. Competition, certainly, is one of the possible answers.

From a regional perspective, for Atlantic Canada, rate rebalancing would have the same negative implications as competition. In this sense, there would also be little basis for choosing between the two alternatives.

A different alternative which may merit consideration is the differential toll pricing scheme outlined earlier in this chapter. This would involve a lowering of toll rates for outgoing calls only, thereby creating a price differential between outgoing and incoming calls, somewhat akin to the way in which railroad freight rates have been structured in Atlantic Canada since the 1920s.

The significance of such a differential pricing scheme is difficult to estimate since the highest volume users are predominately large data users who use either one of the data packet-switched networks or leased data lines, not the public switched telephone network. This point is also relevant to assessing the regional impact of competition and/or rate rebalancing. The fact that a high percentage of data traffic falls outside the public-switched network and that there is already competition in data packet-switched networks means that at least part of the possible benefits of lower toll rates for information firms in Atlantic Canada is an illusion. In turn this makes the weight of the possible negative consequences of competition or rebalancing proportionately larger *from the regional development perspective*.

Another major competitive threat which the pubic carriers now face is by-pass. By-pass refers to the practice of setting up systems which by-pass the common carrier network. Such private systems might operate at either of three levels: inside buildings, within local calling areas or between local calling areas, i.e., in the common carrier toll market.

By-pass represents, potentially, as serious or more serious a threat to the common carriers than does competition in the carrier market, even though it is not yet as significant a phenomenon in Canada as in the U.S. While it is the case that toll by-pass is a definite possibility for intra-firm traffic between different parts of a dispersed operation, the potentially greater threat lies in the development of local area networks (LANs), particularly at the building level.

The dilemma for the common carriers in meeting the by-pass threat is that, to forestall LANs, local rates must fall, whereas to forestall competition and by-pass in the toll market, toll rates must fall, thereby forcing local rates to rise. Thus local rates face competitive pressures from two different directions and it is not clear to which of the two sets of pressures the carriers should respond.

Quite obviously, the competition issue is a complex one, with no easy answers. A much more detailed consideration of the implications for periphery regions is required than the brief discussion that has been offered here. What does come out of this discussion, however, is the need to consider the implications for regions such as Atlantic Canada before any policy decisions are made. It is important also to recognize that the integrated nature of the common carrier telecommunications network in Canada makes this consideration of regional implications important to a discussion of competition anywhere in the country, i.e., the Atlantic provinces will also be affected by competition in Ontario or B.C., not just by competition in the Atlantic provinces themselves.

Adjustment Policies

The discussion of government policy to this point has centred primarily on the question of positive initiatives to promote information industry activities in Atlantic Canada. As and when the information sector emerges, however, other policies to allow the economy and people of the Atlantic provinces to adjust to this change will be called for.

First, appropriate support for complementary infrastructure development, particularly transportation systems, must be maintained and/or advanced. Telecommunications cannot be a substitute in all cases for personal travel. Telecommunications cannot be used to transport physical goods. People and goods must still be able to move in and out of the region conveniently and at affordable prices. The experience with poor airline service by Process Technology Limited, noted in Chapter Four, is indicative of this problem. Similarly, rail and truck transport will continue to be crucial variables to the competition position of Atlantic manufacturers. The fact that the technology of the information economy may reduce the traditional scale economies of large firms, making small and medium-sized firms more competitive or that the technology may permit a widening of markets does not help if the cost of moving goods to market continues to place Atlantic firms at a disadvantage or if the quality of service disrupts delivery times, etc.

Labour markets are another important area where adjustment policies are likely to be called for. First, increasing automation may lead to job displacement, i.e., all things being equal, unemployment will probably rise. In the long run, as information technology creates new activities and strengthens old ones, this problem could be self-correcting. In the short run, however, there will be significant dislocation effects which will call for a response from government.

Second, if workers are to adjust in the longer run, retraining and/or relocation programs within the region will be called for. We have previously discussed the need for training for the specific labour requirements of the information sector and these programs will meet at least some of the needs of displaced workers. But greater effort will also be required in non-information work categories; it is unlikely that all of the workers displaced by automation and/or the structural change occasioned by moving towards an information economy, will have the educational background and experience that will permit them to move into the new information-related jobs. It is also doubtful whether the supply of new information-related jobs will be sufficient to absorb the number of workers displaced.

Third, for government itself, the introduction of technological change will have a different impact on the labour market than for the private sector. In the private sector, as technological change produces gains in productivity, these gains in productivity are translated into lower costs, thereby enhancing competition, generating more business and, in the long run, leading to increased employment. In other words, if the scenario unfolds as it should, any initial job displacement will be recovered in the long run through growth generated by the introduction of technology.

In the public sector, however, productivity gains will simply mean reduced employment. The long-run, offsetting growth effect will not occur without a deliberate decision by government to expand either the scope or scale of government activities. In the present climate of government cutbacks and restraint, this possibility is not a particularly realistic response to consider, particularly if the specific nature of the problem is not recognized.

Assuming governments do try to maintain public sector employment through expansion of activities, however, there may still be a problem at the federal level. For municipal or provincial governments, expansion will balance out the employment impact within the region. But for the federal government, the new jobs from expanded activities may go to other regions, i.e., the new jobs need not be in the region where the jobs are lost.[12]

The public sector employment implications of technological change are important to Atlantic Canada because of the relatively high proportion of public sector employment to total employment in Atlantic Canada. While it is not clear how governments can best respond to the conflicting objectives of a more efficient public sector versus employment maintenance, the problem must at least be recognized. The possibility of expanding public sector activities through the efficiency gains resulting from technology should not be overlooked. Maintaining public sector employment for its own sake, however, has obvious problems. In this case it would be preferable to use the funds to create alternative employment opportunities in the private sector.

On balance, education emerges as one of the most important policies demanding government attention at both the national and the regional level. As is noted by one commentator,

> The impact of the microelectronics revolution will be felt first by women, middle managers and workers in manufacturing industries. Not just older workers will be affected; a very large proportion will be young, with more than half their working lives before them. One appropriate response is massive retraining and, to a lesser extent, relocation of workers and their families. Other types of structural changes may be foreseen – increasing specialization of job skills by individuals, more work at home, increased leisure time and rejuvenation of the arts in every sphere. For the majority of workers, however, the solution to structural unemployment will be re-education. Such programs, costing billions of dollars, will require substantial reordering of government priorities. Ultimately, it is not inconceivable that as much as five per cent of GNP will be dedicated to retraining and relocation on a continuing basis.[13]

Conclusion

This discussion of government policy relative to the impact of telecommunications services and the information sector on regional development in Canada, with a focus on Atlantic Canada, has highlighted a number of areas where public policy has an important role to play.

The essential underlying premise of the discussion is the need for both provincial and federal governments to recognize the potential of information activities as a vehicle for redressing regional economic disparities and, at the very least, to recognize that without deliberate effort by government, the technology itself could, and probably will, exacerbate regional disparities. Some of the specific policy initiatives that have been discussed here may well be debated; there may be, and are, many other specific policy alternatives which could be suggested or tried. What is most important is that policy makers perceive that there is a regional dimension of the information economy which must be considered.

It is also important to recognize that in the course of the policy discussion presented in this chapter, there has been a number of implicit if not explicit recommendations regarding the private sector role.

Government can play an important part in fostering the right environment, ensuring the appropriate infrastructure is in place, providing training/retraining programs, etc. But it is private sector initiatives which will determine the ultimate impact of these efforts.

Not only does the private sector have a role that it might play; it has a role that it must play. Government is not a substitute for private entrepreneurship. Government can provide market intelligence or the means to obtain it, but it is business that must use it and know how to use it. Venture capital is required. Support for training/retraining programs is required. Perhaps most important, the private sector has an obligation not to wait passively for government to act. It must act on its own where possible and work collaboratively with government where there is an essential role for government to play.

As argued by Amin and Goddard, "[the innovation process] may be described as a series of distinct chronological steps or points at which critical non-routine (entrepreneurial) decisions are made. These decisions can be seen as responses to, or attempts at creating, market conditions favourable to the enterprise. By inference, regions lacking entrepreneurial managers or powerful market-shaping enterprises are likely to lose out in the essentially competitive process of technological innovation".[14]

Notes

1. As a footnote to this point, the Report of the Royal Commission on the Economic Union and Development Prospects for Canada contained no discussion of the information economy *per se* and only a few pages on new technology in general.

2. The point here is that, unlike other intermediate-good imports, computers (and software support) imported by business firms are treated as final products for federal excise and sales tax purposes. This obviously adds considerably to the cost of these items in Canada and, in relative terms, makes Canada a far less desirable location for data processing centres, computer service bureaus, etc. For further discussion relevant to this point, see P. Grady, "Computers Could Be Cheaper", *Policy Options*, 5, 1, 1984, p. 52.

3. For a brief review of the Telidon program, see B. Lesser and D. Schellinck, *Marketing Strategies for Mass Market Computer Communications Services*, Working Paper, Information Society Studies Program, IRPP, Halifax, 1986.

4. A. Cordell, *The Uneasy Eighties*, Background Study 53, (Ottawa: The Science Council of Canada, 1984), p. 37.

5. Amin and Goddard, *op. cit.*, p. 10 (underlining added for emphasis).

6. Rail freight rate subsidies were introduced in the Maritime Freight Rates Act, passed by Parliament in 1927.

7. A. Cordell, *op.cit.* Also, work in the U.S., (see H. Hudson, *The Growth of the Information Economy: Regional Implications* in C. Gotlieb, *op. cit.*) predicts that the fastest growing jobs will be the unskilled occupations of janitors, nurses' aides, sales clerks, cashiers and waiters and waitresses. Only three or four of the "top 20" occupations in terms of job growth will require an education beyond high school and only two will require an university degree. Some writers have suggested that what will emerge will be, in effect, a dual labour force; one group of high-skilled, high-paid workers and another of low-skilled, low-paid workers; the middle of the labour force will disappear. See Marc Weiss, "*High technology industries*

and the future of employment" in P. Hall and A. Markusen, *Silicon Landscapes*, (Boston: Allen & Unwin, 1985).

8. This need not imply government subsidization of users. The fundamental point is that small users often cannot afford the large capital investments which adoption of new technology implies and do not have need for the full capacity of the installed plant involved. Thus a mechanism to permit a sharing of such facilities, by having the government act as the supplier, is required.

9. Economic Council of Canada (1977), *op. cit.*, Economic Council of Canada (1980), *op.cit.*, and The Royal Commission on the Economic Union and Development Prospects for Canada, *Report*, Vol. Three, (Ottawa: Supply and Service, 1985).

10. Greg Barr, "Hi-tech", *The Citizen*, Ottawa, Tuesday January 28, 1986.

11. CNCP's initial application to the CRTC for interconnection rights to the local switched network was rejected by the CRTC. CNCP is now asking CRTC to reconsider this decision.

12 This point was previously discussed in Chapter Three.

13. *Planning Now for an Information Society*, Science Council of Canada, 1982, p. 44.

14. Amin and Goddard, *op. cit.*, p. 11.

Chapter 6:

Conclusion

The information economy will be important to all of Canada's regions. For some regions, however, that importance could be more negative than positive.

Telecommunications technology and the services/ applications it makes possible are the distinguishing features of the information economy in terms of regional impact. It is the communications component of information-based activities that introduces a spatial concern to the debate and opens the question of how the benefits of the "information age" will be shared among Canada's regions. The telecommunications network itself is not the determining factor, however, in answering this question.

In general the telecommunications network, assuming it is of an approximately equivalent nature in all regions, will be neutral with respect to the regional distribution of the development benefits of network usage/applications. It may promote either a centralization or a decentralization of economic activity and of information. The determination of outcome will depend not on the network but on the structural/institutional characteristics of the regional economies, on labour force characteristics and on demographic characteristics.

All of these factors put less developed regions at a disadvantage relative to more-developed regions in gaining a significant share of the development benefits made possible by telecommunications in an information economy. Using Atlantic Canada as a specific focus of analysis, it has been shown that in terms of industrial structure, occupational mix, levels of educational attainment, level of urbanization, representation (or lack of representation) of national firms and large firms, diffusion of computer technology, availability of computer support services, etc., the Atlantic region is not at present well-positioned to benefit proportionately from the information economy. The major conclusion which comes out of this analysis is straightforward: left alone, market and structural forces are likely to result in the Atlantic economies losing in relative terms as the information economy grows. In a market-driven environment, centralization will win out over decentralization. Consequently, regional disparities will be exacerbated, not alleviated.

The key element to this conclusion is the emphasis on market and structural forces. Government policy can change this outcome. Technologically, a different outcome is both possible and feasible.

The range of policy options open to government range from the general to the quite specific. First, there is a clear need for appropriate planning by government. This, in turn, calls for a national informatics policy as a framework within which regional initiatives and/or concerns can be taken into account.

Second, there is a need for a greater focus on service sector activities in the range of initiatives supported by regional development programs. Traditionally, such programs have been primarily concerned with goods-producing sectors despite the fact that, in terms of employment, service sector activities are the fastest growing segment of the labour force and now represent over 60 per cent of employment nationally. This shift in focus does not call for new instruments, except insofar as new instruments, whether grant or tax-based incentives, are under consideration anyway. Rather it calls for a redirection of existing instruments to the service sector in general and information-based services in particular.

Third, there is also a case to be made for inclusion of telecommunications in infrastructure development programs undertaken as part of regional development efforts. Historically, this has never been done. While network development in Atlantic Canada, on average, is roughly on a par with the rest of the country at this point, the availability of services/capabilities is not uniform within all parts of the four Atlantic provinces.

Fourth, the question of telecommunications costs should be examined from two perspectives. First, telecommunications costs are distance-sensitive and may, therefore, be an impediment to firms locating in the Atlantic region when those firms are serving a national or international market. Some subsidization of telecommunications costs for such firms may, then, be in order. Second, the prospect of carrier competition in the long distance or toll market and/or rate rebalancing is expected to result in a lowering of long distance rates and a raising of local service rates. The latter effect will have a negative impact compared with the present rate structure, on small business users, on small communities and on rural areas, all of which are now subsidized to some degree within the existing rate structure. These groups, proportionately, are more important in Atlantic Canada than in some other parts of the country. The implications of such a change, therefore, requires examination in terms of possible impact on the diffusion of services and network quality within such areas of the Atlantic provinces.

Fifth, there is a need for government to adopt policies to encourage a greater diffusion of computer technology in Atlantic Canada. On a proportional basis, the region lags in this regard. Specific initiatives might include counselling programs on technology for business users in the region, especially small-and medium-size business; research into new applications of the technology and new service offerings; and provision of shared computer facilities where technical requirements involve machines that are too large either to be afforded or fully utilized by small and medium-sized business.

Sixth, the educational requirements of the information age require major action. There is a need to provide the general education to equip workers for the specialized training required; a need to assist in providing, also, the specialized training needs in cases where firms are too small to mount their own in-house programs or where the "once-off" nature of the training precludes firms from mounting such programs; and a need to provide for the retraining needs of workers who will be displaced by the technology. From a slightly different vantage point the university sector of the education system in Atlantic Canada represents a pivotal resource for promoting research and development activities for application in the region and for helping to create an environment conducive to "leading-edge" firms locating in the region.

Seventh, there is a general need to promote a positive climate for investment in information activities in the region. This includes the encouragement of research and development just mentioned but also goes beyond this. There is a need to provide venture capital; a need to re-focus existing grant and tax-incentive programs; and a need to work in concert with private business, in a co-operative way, to develop and promote new applications of the technology and new information-service industries.

Finally, as an overall conclusion, government policy must recognize that the regional implications of the information age are, in the first instance, a matter of extreme importance. All of the preceding policy conclusions depend on such recognition.

In relative terms, Canada's less-advantaged regions have failed in their bid to industrialize. As the economy now moves into the post-industrial era, it is crucial that they not fail again in the same relative way. For Canada's less-advantaged regions and, by extension, for the country itself, this is both one of the principal challenges and one of the principal opportunities of the information age.

Addendum

A draft version of the present volume was used as the basis for an Institute-sponsored workshop on "Telecommunications and Regional Development", held in Halifax in June 1986. An invited audience of industry, federal government, provincial government and academic representatives met for a day to discuss the draft report and the more general topic of the role of telecommunications in regional economic development.

Participants in the workshop were invited to submit short statements either on the Institute study or the general topic, for inclusion with the final published version of the study. Two of the industry participants, Maritime Telegraph and Telephone Company Limited and Newfoundland Telephone Company Limited, accepted this invitation; their statements are printed in this addendum to the main study report.

Maritime Telegraph and Telephone Company Limited

Regional development in Atlantic Canada (Nova Scotia, in particular) cannot be positively influenced to any major degree by available telecommunications services. If, however, a case can be found where development can be impacted, 'subsidies' should go directly to the end user rather than the carriers. This could, however, create artificial demand for telecommunications services that would evaporate at the whim of a government that decided to terminate the grants. Telecommunications services have developed to a high level in Atlantic Canada without the need for government assistance. It should remain thus.

The report acknowledges that the carriers have generally provided new services in remote areas when required to do so (e.g. Rio-Algom, Yarmouth). As long as there is monopoly protection for basic network services, this could continue to be the norm. Only if competition becomes pervasive in the industry might governments have to consider infrastructure grants to "rate subsidize" new services in the more remote parts of the region. This risk in itself constitutes ample reasons for provincial governments and regulatory agencies in Atlantic Canada to very carefully consider the full implications of allowing extensive competition in the telecommunications sector.

Newfoundland Telephone Company Limited

In general, Newfoundland Telephone agrees with the study's conclusion, that while the existence of a well developed telecommunications infrastructure will enhance regional economic development initiatives, in and of itself it is not a guarantor of regional development. As the study points out, many other variables, e.g. market size, labour force, attributes of the local economies, etc. all play a role in the economic development process. Newfoundland Telephone has, however, recognized the role, one which is assuming increasing significance as we enter the "information age", that telecommunications plays in all forms of regional development, social as well as economic. In this regard, it has been our objective to ensure that the telecommunications infrastructure is in place as and when required to meet the needs of all segments of our province.

As the study notes, while there may be differences in the levels of service found between urban and rural areas in the Atlantic provinces, this is true of all parts of Canada and likely reflects the realities of market demand in rural areas. To suggest that rural areas are intentionally serviced at lower levels than are urban areas is not typical of the historical situation in Newfoundland. Unlike many telephone companies in Canada, for example, including those in larger centres, Newfoundland Telephone makes individual line service available to all of its subscribers, whether in rural or urban areas. While a maximum of two-party service is available, this is a service option provided only upon customer request. Consequently, those subscribers in Newfoundland Telephone's territory who have two-party service have it because of choice not because private line service is not available to them.

Newfoundland Telephone also agrees that the development of a national informatics policy is a prerequisite to the development of regional policies. In this regard, we believe that there are lessons to be derived from the industry's experience with telecommunications regulatory policy. While governments are now wrestling with the development of a national telecommunications policy, concerning basic objectives and regulatory issues, significant decisions had already been made in certain jurisdictions which resulted in what had been a consistent policy framework being replaced by a mosaic of varying policies and operating conditions affecting basic issues. If the same circumstances are paralleled with respect to informatics policy, it is very likely, as the authors point out, that complementary regional policies will either be conflicting or even completely ignored.

The study also discusses the concept of the selective subsidization of communications costs for firms locating in the Atlantic region. While the company has always been of the opinion that the relative importance of telecommunications costs, in most businesses' operating budgets, is not that significant a factor, we agree that anything governments can do to increase the attractiveness of the region to business is a positive step. While it may take more than just reducing communications costs, if this were part of a "package" of enticements, it may help. In this regard, however, we emphasize that such subsidization should go directly from government to users and need not involve the regions' telephone companies.

In general, the study acknowledges that the telecommunications infrastructure in the Atlantic region is comparable to that found in other regions of the country. As a telecommunications carrier serving a demographically small and dispersed market and operating in what can at times be a hostile environment, we are proud of this fact. Moreover, we feel that a key role of telecommunications carriers is ensuring the availability of an efficient system to meet the voice and data communications needs of business. While we agree that, in the final analysis, usage is more important than technology diffusion, without that diffusion there can be no usage.

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Telecommunications Services and Regional Development:

by Barry Lesser & Pamela Hall

The industrial age bypassed what are now Canada's less advantaged regions; the challenge of the information age will be to keep history from repeating itself. The economic and social impact of information technology will not, without conscious policy direction, be the boon to all mankind which the futurists of twenty and even ten years ago were heralding.

The authors warn that left to market forces, the decentralizing potential of the new technology will not be realized. There already is some evidence to suggest that less-advantaged regions are becoming more disadvantaged, compared to the central regions, because of information technology. The Atlantic provinces, in particular, will lose in relation to other regions if market forces alone are left to decide the outcome. To alter this result, government action is required.

Among the authors' recommendations: a national policy framework within which to fit regional policies; government focus on the application or content side of the information economy; and a recognition by government policy makers that without deliberate effort by government, technology may exacerbate regional disparities.

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